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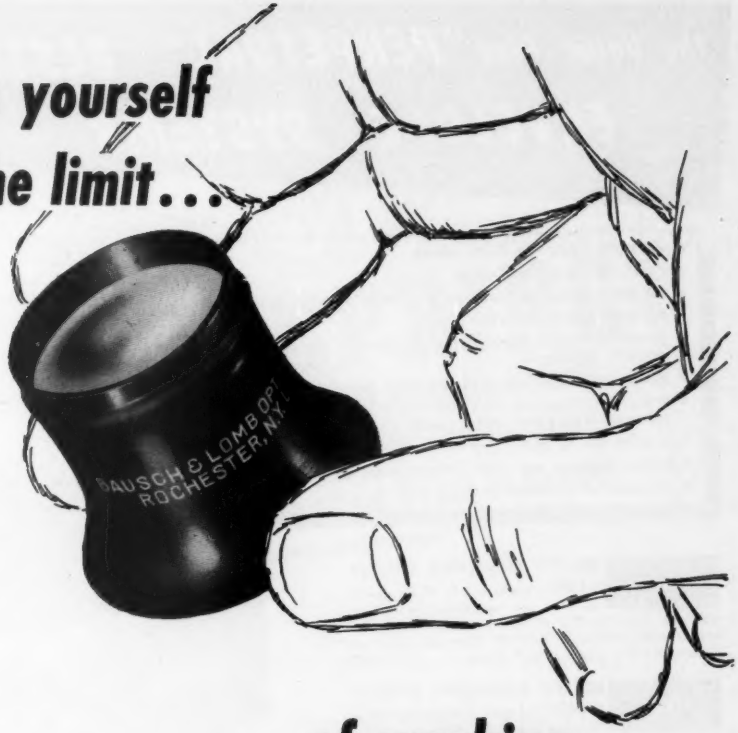

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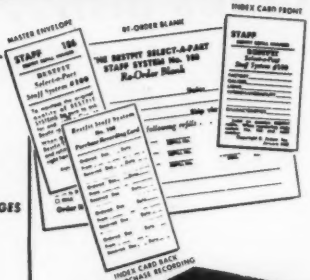

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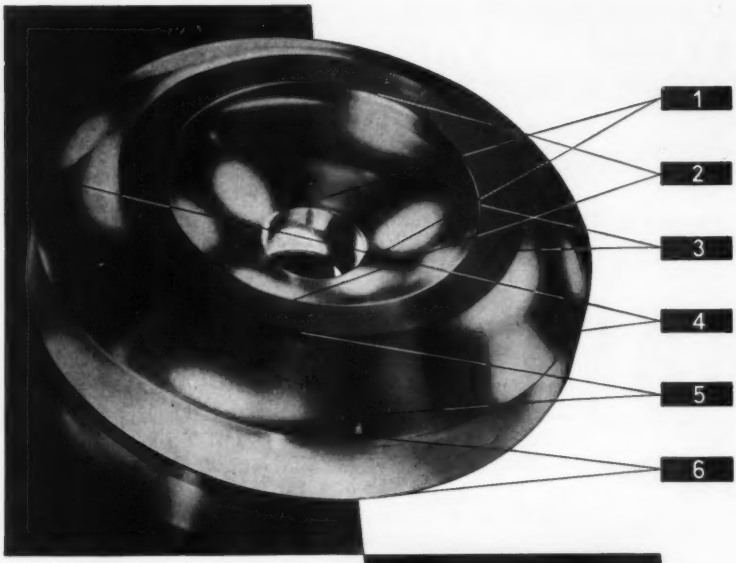

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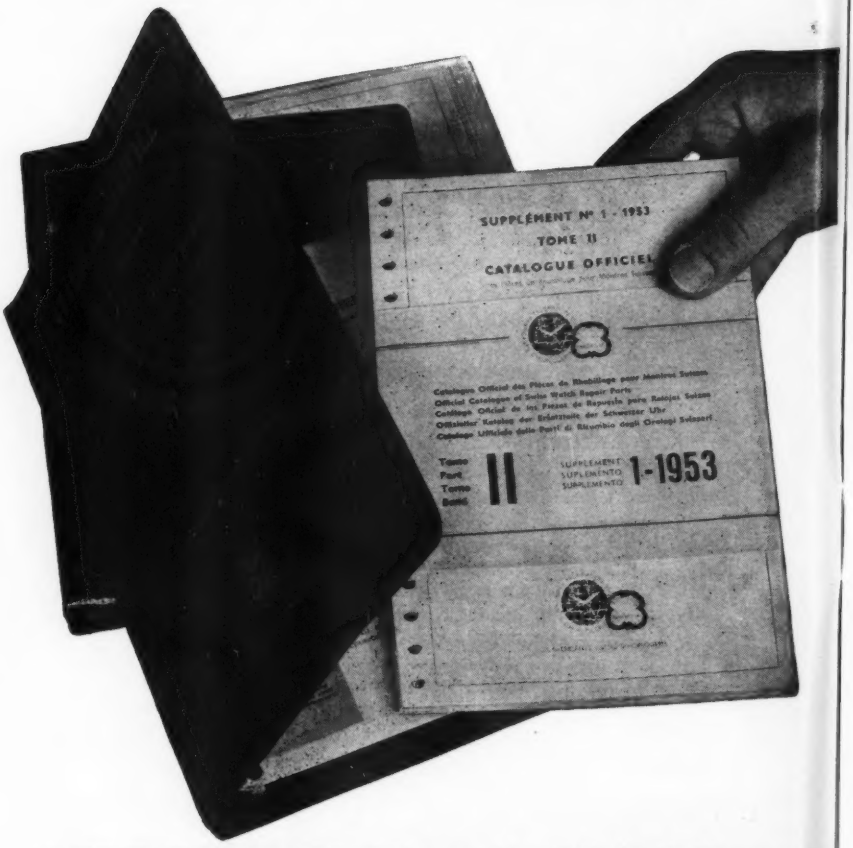
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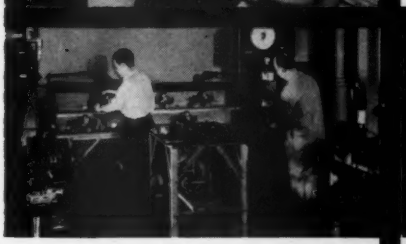

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The Fusee Chronometer

(Following is an observation on the marine chronometer which should be of interest to our readers. It was taken from the German magazine "Deutsche Uhrmacher Zeitschrift," and translated by R. Freudenberg, former instructor in engraving at the American Academy of Horology. —Ed.)

IN DRAWINGS I and II of Figure 1 are shown the barrel (Federhaus) and snail (Schnecke) arrangement of the chronometer. No. 1 indicates the U-shape arrangement, while the chain in No. 2 follows the S-shape. There is quite a difference in the effective operation of the two.

Observing No. 1, we see that the chain is pulled by the barrel in direction of the arrow *P*. At *D*, where the center pinion engages the snail wheel, one can visualize the turning point of a one-arm lever *D-ZL-K*. The force is applied at *K* and the drag *L* must be taken up by the arbor *Z*. In this type lever action, the drag *L*, or pressure on the pivot, is considerably greater than the driving force *K*. The friction of the arbor *Z* is determined by the pressure applied, as is quite noticeable in this construction.

In No. II, *D* is again the turning point of the single-arm lever, but as the force is applied at *K* the drag at *L*, also the pressure and friction on the pivot *Z*, is only a fraction of the arrangement shown in No. 1.

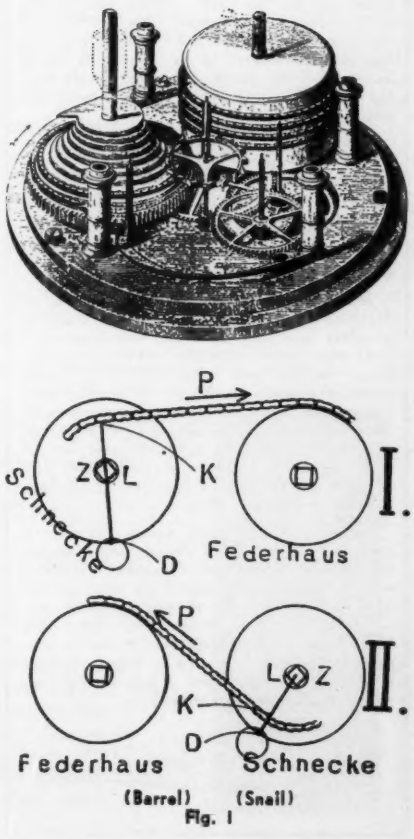

Fig. 1

WAKMANN WATCH WAYS

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By Icko Wakmann

Three gentlemen, of high social position, were once playing hazarde. Now, hazarde is not a mere pastime. It is a gambler's game, for high stakes. And what happens in such circumstances? Yes—into the players' room broke the police!

In a matter of minutes, the 3 gentlemen stood in court. The judge summoned the first man to the bar. "Were you gambling?" asked the judge. "No," answered the man. "Do you swear?" asked the judge. The man reflected: if he swore, he could be free; if he didn't, he would go to jail. Up went his right hand, and out rang the answer, "Yes, I swear!"

The judge summoned the second man. "Were you gambling?" he asked. "No," said the man. "Do you swear?" demanded the judge. "I swear," answered the man. The judge summoned the third player, and asked, "Were **you** gambling?" "Listen," answered the man, "If those two didn't gamble, with whom did **I** gamble?"

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As the point *K* is not stationary but moves from place to place when the chain pulls on a larger or smaller circumference of the snail, the pressure varies during the space of a day in one arrangement as well as the other. The difference in strength of pull is taken into consideration by the calculation of the shape of the snail.

Ample driving time and the change in driving power account for sea chronometers having two-day movements. Due to the snail arrangement, one can expect the surest drive of the chronometer during the first 24 hours, and to overlook the slight variance the following day. In the event a chronometer runs for two days without being wound at sea, the time change of the instrument is determined by the location of the ship. This procedure usually only takes place in a harbor, where it is not important, as at sea the chronometer is wound regularly every 24 hours. Any difference in timekeeping of the chronometer between the first and second day is generally negligible.

The chronometer escapement is just the opposite of the cylinder and lever escapements in relation to sensitivity to driving force. When the cylinder escapement has a strong driving force, there is also an increased friction which the escape wheel must overcome at the cylinder, and the arc of the balance wheel does not change much as the driving force varies. The same effect occurs in the lever escapement —the difference being in the snail drive.

In the chronometer escapement, the slide takes place by a small lever arm which is unlocked by the stone in the small roller. Here, the pull on the locking stone is less than in the lever escapement, as the power of the drive spring is amply sufficient to secure the locking of the tooth. The release resistance is practically always the same in this escapement regardless of the pressure of the driving wheel. On account of the balance wheel changing its arc under a different driving force, the snail drive in sea chronometers is an essential part.

Figure 2 shows details of the fusee chain construction. Hook *R*, at the left, is fastened to the snail, and the other hook, *T*, is affixed to the spring barrel. Each of

the chain ends has a distinctive shape to prevent error in hooking-up.

The method of assembling a fusee chain is also shown in Figure 2. The rods, which are easily riveted after shortening, are manufactured of oil-hardened, light blue steel in order to withstand the pull which the chain must undergo. The chain is fully soaked in oil after overhaul, and only wiped off before replacement. The oil which is pressed out of the chain onto the mainspring barrel should be allowed to remain, as the chain needs the oil and will absorb it in time.

During the last decade or so, the chain in sea chronometers has been replaced by a copper spring plated with beryllium. This material is superior to steel, as proven by test, and absolutely dependable in chronometers. Even this spring, however, cannot last forever under constant tension, and must be replaced the same as with an elevator cable when an overhaul takes place.

Figure 3 shows the so-called ratchet wheel pushed upon the snail, and the key *L* which holds all the snail parts together the same as on a pendulum clock. Ordinarily this key would be made of steel, but in the English chronometer it is made of brass. When the English specialist has tightened this brass key, he places a hollow punch at *A* in Figure 4 and gives it a light blow—holding the snail wheel, and not the snail body, in his fingers. Thus,

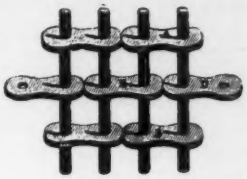

Fig. 2

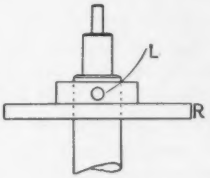

Fig. 3

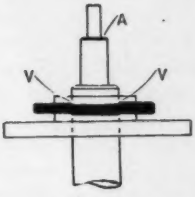

Fig. 4

the key *V-V* is slightly bent, and though it can be removed, will never fall out by itself. A little manipulation at *V-V* will enable the snail wheel with the ratchet to sit a trifle loose on the arbor. This will eliminate clamping with opposite wheels, and the possibility of failure of reserve power by winding and proper meshing of the teeth of the drive wheels.

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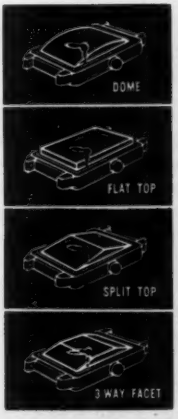

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THE AUTOMATIC WATCH

By M. GRUENIG, President,
Montilier Watch Co. S.A., Switzerland

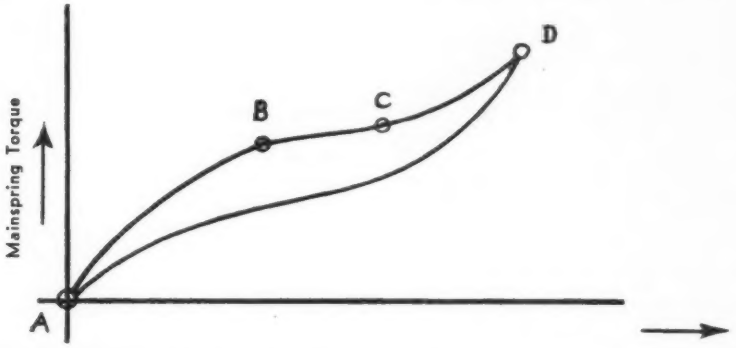
The automatic watch may be called the Watch of the Future. In the history of watchmaking, the self-winding watch presents many improvements over the ordinary wrist watch.

One of these many improvements is the fact that the mainspring is kept in constant tension. Since the winding of the watch is insured by the motion of an oscillating weight or rotor with the required energy emanating from the movement of the wearer's arm or body, the mainspring is practically under a constant tension.

3. From *C* to *D*, the moment of force increases.

The mainspring having a constant tension is also going to deliver a constant flow of power to the train, therefore the watch will have a constant running and its timing quality will be improved. In other words, the mainspring will work at its best point of tension.

In the automatic watch the mechanism consists of an oscillating weight, which moves at the slightest motion of the arm, and a train wheel whose purpose is to transmit the mechanical energy of the oscillating weight to the barrel, winding up the mainspring.



Number of turns curve. Upper curve occurs during winding, lower curve occurs at unwinding.

If we consider the curve *A B C D* which is the curve of tension of the mainspring, we have in *B* a moment of strength equal to the ordinate of this point. At *B*, the moment of strength remains almost constant to point *C*. After *C*, this moment increases to reach its maximum at point *D*.

If we look at this curve *A B C D*, we notice three different phases of the winding up of the mainspring.

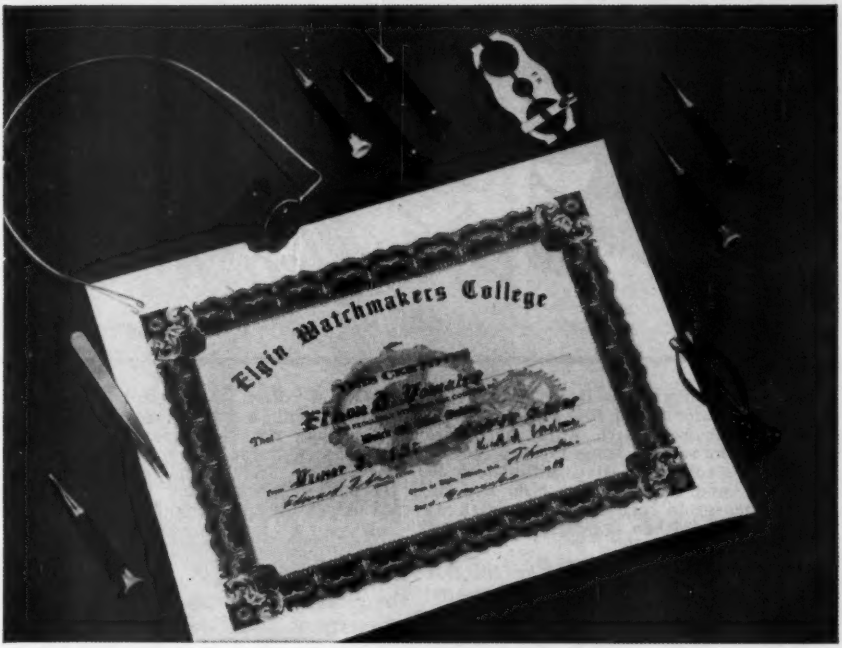
1. From *A* to *B*, the moment of force increases.

2. From *B* to *C*, this moment of force is almost constant.

To avoid any over-tension of the mainspring and to also avoid breakage of that part due to over-winding, a system is provided in the barrel to prevent these damages. This is done by adding one sliding bridle to the mainspring.

Naturally, if a person does not wear the automatic watch, the automatic mechanism will not function and the watch will stop.

Usually, if the watch is worn during the day, it will register enough power to run during the course of the night.



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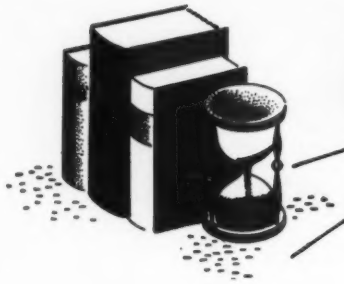


INFORMATION *Please*

AL: My watchmaker's lathe is powered by a 1/12 motor that I find quite satisfactory for general watch work, but quite often I want to turn some large pieces of brass or steel up to five millimeters in diameter, and that is when I do not get enough power to turn the heavy work. Is there any way I can use this small motor for extra heavy work?

Answer: From your letter we assume that you are driving the lathe direct from the motor. With this system it is so that as you reduce speed, you also reduce power, just contrary to what you need. May I suggest you procure a good countershaft and install it between the motor and the lathe, then belt up from the small pulley on the motor to the large pulley on the counter shaft, then from the small pulley on the countershaft to your lathe. These are both cone pulleys, and it is an easy matter to change the speed by changing the position of your belt. By this means you will be reducing the speed of your lathe but increasing the power at the same time.

MCJ: How can I adjust the escapement in a watch where the lever comes to rest against solid banking pins? At sometime the supports or solid banks were cut away, allowing entirely too much slide and total lock.

Answer: Taking it for granted that the drop lock is light and safe, you can open up for angular motion to the lever by cutting away more of the solid banks, then drill and tap a hole for a banking screw, then let the banking screw take care of the lever action in order to get the proper adjustment. A quicker way, but not so good, is to drill small holes in the plate and then insert pins to act as bankings.

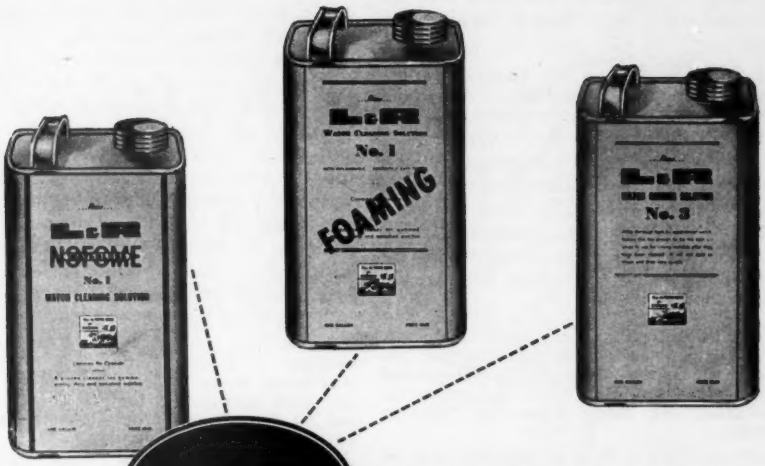
AME: I often have bad luck when straightening a balance pivot, and more often than not, they break. I use a AA tweezers and for heavy pivots like clock work, I use a small smooth jaw pliers. Is there any special trick to straightening pivots without breakage?

Answer: It has been found by experienced workmen that the percentage of breakage when straightening pivots can be greatly reduced by using a heavy brass tweezers or brass-lined pliers. The pliers or tweezers are to be heated quite hot, but not hot enough to draw the temper of the pivot. The hot tweezers will relieve the strain while the pivot is straightening, however your writer would not recommend straightening balance pivots for high grade work. Better tell your customer that only satisfactory results and proper timekeeping qualities can be restored to the watch by installing a new balance staff. It is theoretically claimed that a bent balance pivot can never be straightened perfectly to its original shape, as there is a strain where the bend occurs, and when trying to straighten a pivot, the pivot itself will bend either side of the strained section, thus making

INFORMATION PLEASE

Directed by
W. H. SAMELIUS

Chairman, Science of Horology and Technical Advisory Board



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WATCHWORD OF THE WATCHMAKER

L&R

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a hump. For inferior watches it may be practical and cheaper than to install a new staff.

DI: How is it that all wooden or iron signs hanging on the outside of the jewelry store show the hands placed at 8:22?

Answer: By painting the hands to show the time as 8:22 gives a balanced space on the upper half of the dial to accommodate the jeweler's name. The story has been told many times that President Lincoln was shot at 8:22, which is erroneous—the fact is he was shot sometime between ten and eleven p.m.

FTS: In our country elk teeth are in demand, and it is known that many of the teeth are not genuine, being substituted with imitations. How can I determine an imitation elk tooth from the genuine tooth?

Answer: Place a drop of muriatic acid on the tooth, and if it is an imitation, the surface will become bleached and sticky, whereas a genuine elk tooth will not be affected at all.

GP: Should a railroad watch be regulated by means of the timing screws and the regulator left intact on the center of index?

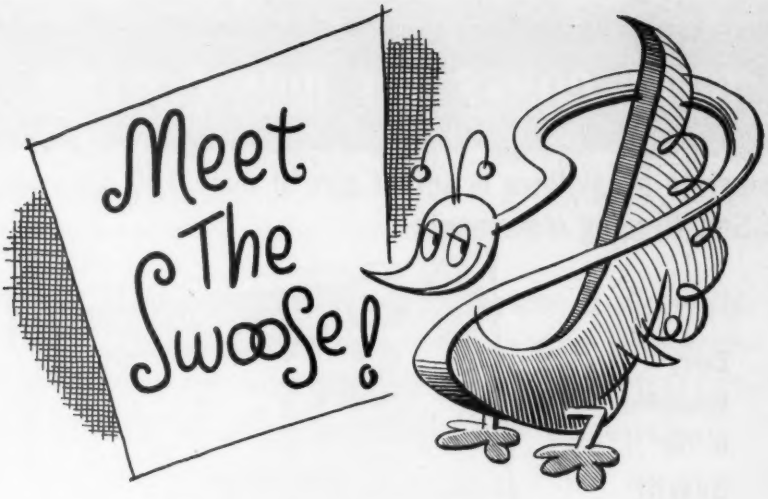
Answer: It is permissible to move the regulator slightly for close regulation, leaving the pointer of the regulator close to the center, as the regulator was put on for that purpose. However, if to bring the watch to time would place the regulator well way from the center of the index or to the limit of the scale, then timing screws should be used, putting the regulator on center and timing the watch withing a few seconds a day, then for final timing we can use the regulator. Isochronal and position adjustments are based on curb pins located, as with the regulator, on the center of the index scale.

FE: I have an old English watch having a chain that runs from a plain barrel to a spiraled mainwheel, I think it is called the fusee. The chain is badly rusted, the links are stiff and will not flex. How can I make the chain useable? I have tried to get a new chain but with no success.

Answer: Soak the chain in kerosene for three or four hours, allowing the kerosene to cut out the rust. Cut a narrow slit in a hardwood file handle, a slit in the wood to be just wide enough to accommodate the thickness of the chain. Then by holding both ends of the chain and pulling it back and forth through the slit in the handle, lubricating with kerosene, the links will readily loosen up, and at the same time you will be removing the rust from the sides of the chain. When the links are fully free, clean the chain and repeat the operation, but instead of using kerosene, use clock oil. As a second warning, I repeat, don't have the slot or slit in the file handle any wider than the thickness of the chain. If the slot is too wide, there is danger of the chain turning on the sides, thus causing it to be ruined or badly distorted.

TPA: I have been instructed that when making a winding stem for a Swiss watch, to make it from soft steel first, and then harden and temper it last. They tell me the watch factories use this method. Can I have your opinion?

Answer: It is true the watch factories make their stems from soft steel, as it is easily and quickly machined in the automatic screw machines, and they are made up in lots of many thousands at one time. However, the factories are equipped with special furnaces that are heat-controlled, both for hardening and tempering, so when the piece is finished, there are no fire marks or burns on the surface. The outside workman is not equipped to harden and temper steel the same as the factories do. If the stem is made by hand from soft steel, and made to fit the watch, there is always danger that the stem will warp or be overheated, ruining the carbon content. Then to temper the small stem of irregular thickness, there is the possibility of uneven heating so that some part of the stem may be soft or too hard. Then again, after hardening or tempering, there will be more or less scale or firemarks on the stem which must be removed, and by the time you have restored the surface, you may find the stem too small. Your writer recommends that you harden and temper a plain steel rod to a rich blue, being careful not to heat the rod beyond cherry red before quenching and when tempering the rod, heat it very slowly so the heat will penetrate throughout. Then when you cut the stem to fit the watch, there is no further work to do and the stem will be evenly hardened, and tempered and true throughout.



The terrific strides made by science in this day and age has carried into many strange fields. A little publicised project is that presently being undertaken by a dedicated group of research technicians toward the development of new varieties of bird life for the commercial market.

Pictured above is the SWOOSE (not yet in commercial production) a combination of a Swan and a Goose. Also in the developmental stage is the FLOUSE (crossbreeding of a Flamingo and a Grouse) the STOWL (mating a Stork with an Owl), the Snark (getting a Snipe together with a Lark), the QUOOSTER (a Quail mixed with a Rooster) and many others.

Since these are not in our line we doubtless will not be able to supply them* from stock when they are on the market. However in the field of Watchmakers' and Jewelers' Tools, Materials, and Supplies, which is our particular racket, we do keep up with the best and latest. If it is available and has merit, we have it.

* Except on special order, of course.

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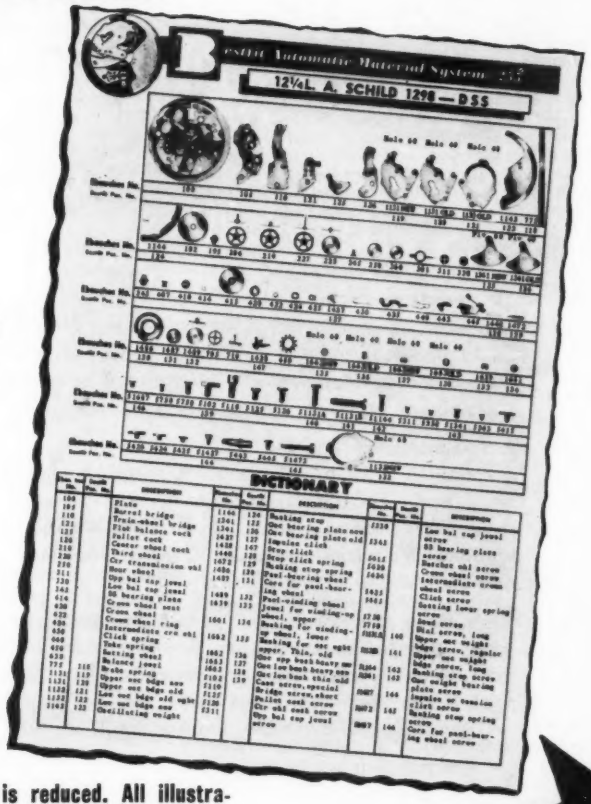

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LEA: On many of the small Swiss watches I have trouble getting a close rate in pendant positions, compared to the dial positions. The dial positions are mostly fast, and I note the cap jewels are set with the flat side towards the pivot. Would setting a new cap jewel with the oval side to the pivot change the rates?

Answer: Reversing the cap jewel so the balance pivot rests on the center of the oval surface of the cap jewel will bring the friction of pivot on center, thus allowing the balance to take a longer arc, causing a slower rate. Rounding the end of the balance pivots riding on a flat cap jewel will cause a slower rate in the dial positions; however, it is more advantageous to have the end of the pivot ride on the oval surface, especially if there is a flat balance hole jewel in the watch. The oval cap jewels opposite the flat-faced balance hole jewel will cause capillary attraction; retaining the oil around the pivots where a flat cap jewel and a flat balance hole jewel is employed, no capillary attraction exists and the oil will more likely than not spread, leaving the pivot dry.

CES: Some time ago some friends and myself had the thrill and pleasure of a tour through the Elgin National Watch Company plant. Our guide was very courteous and generous in his explanations about the various operations. On leaving the plant, we glanced up at the tower clock and it became a guessing contest as to just how big the dial was, and what kind of movement drove the hands. Any information you can give about the clock I am sure will be interesting and appreciated.

Answer: The diameter of the dial of the tower clock is fourteen feet, seven inches. The hour hand is four feet, six inches long, the minute hand is six feet, six inches long. The hands are made of white pine, shellacked and painted black and each hand has a counterweight. The pendulum is thirteen feet long and weighs 360 pounds, the striking weight weighs 7000 pounds, the time weight 2400 pounds. It has a gravity escapement and is automatically wound regularly.

FR: The small safe I have is heavily magnetized and is causing me a lot of trouble as watches placed in it overnight become magnetized. Is there any way to de-magnetize a safe?

Answer: Your writer does not know of any sure way to eliminate the magnetism from the safe, but from hearsay, try the following method. Connect the safe by wire to a water pipe or any other method so as to make a good ground. It is stated this will draw the magnetism into the earth. Perhaps some of our readers have had similar experiences and may enlighten us on how to remove magnetism from a safe.

FWB: In one of my text books they recommend using ferric oxide for polishing pivots. What is it and where can it be obtained? I cannot find it listed in any catalogue.

Answer: Ferric oxide is rouge, or oxide of iron. It can be procured from any watchmakers' supply house. For polishing pivots it is used in fine powdered form mixed with oil to the consistency of putty and the polishing is accomplished by applying rouge with a bell metal slip or tin slip or even a boxwood slip. Rouge will give a black polish such as you find on all old English watches. Diamontine can be used by the same method satisfactorily, however, where diamontine is used as a polishing agent, the surface will have a whiter appearance.

MK: What does the law require a person to do with a watch that is left for repairs and not called for? I have several watches that I have held for years, and need this information.

Answer: Different states have different laws covering this situation, and as you are located in the state of New York, may I suggest you correspond with Henry B. Fried of the Horological Society of New York, 122 Tillary Street, Brooklyn, New York, for the laws of that state.

AC: In cheap watches where one finds threads in the plate stripped, or the screws slipping, is it permissible to flatten the screw for a quick job, as one must use common sense in earning a living?

Answer: Even for the cheapest watches or clocks we condemn such botch work as hammering and flattening a screw. If the owner's idea of cheap work is so low as to demand a job like that, then it would be far better and more profitable on your part to refuse to take in the job, as nothing but dissatisfaction and loss of reputation can result from this kind of work. Your reputation is more valuable to you than

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E406	4	12	9½"	E545	6	11	13½"
E412	4	13	8½"	E599	7	10	10½"
E413	4	13	9½"	E601	7	10	11½"
E414	4	13	10½"	E609	7	11	10½"
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the money you would take in for a quick botch job.

HZ, Jr.: I would like to have your opinion as to how is the best way to set a railroad watch to correct seconds. To take a screwdriver, tweezer or pencil and move the second hand around to the correct time to correspond with our regulator, that is, to cause the hand to slip on the fourth pivot, or take a camel's hair brush and stop the balance, holding the second hand until the time coincides, then set the minute hand afterward to the correct minute. Some of our railroad men object to opening the case and using a camel's hair brush, saying there is a possibility of dust from the brush entering the movement. How do you recommend setting a railroad watch to correct seconds?

Answer: There are always some hazards when setting a watch as you describe by using a screwdriver or any other tool to force the second hand to time. First, when the second hand fits tight, by forcing it you will be exerting extra power to the fourth wheel and the escape wheel, thus causing the balance to take extra heavy motion, which may in turn result in a broken roller jewel. There is a possibility of bending the fourth pivot, and the second hand being tilted so one end may rub on the dial and the other end catch on the hour hand. It may become loose on the pivot. Stopping the balance is the safest way to set the watch on time, as you must bear in mind that the second hand has been fitted properly and level with the dial, and twisting it out of position may make it necessary for you to bend or straighten the second hand until it is free from the dial. Using a camel's hair brush sounds good, but there is always the possibility that the brush may have dust or lint in it that could possibly get into the movement, then again, using a camel's hair brush might allow some of the hairs to find their way into some of the train pivot holes or jewels, thus drawing out the oil. To avoid any of these hazards or troubles, may I suggest you use a piece of tissue paper folded to a point, then it is an easy matter to stop the balance until the second hand is on time.

HL: At a guild meeting we had a speaker who spoke on the history and different escapements which have been in use. He mentioned among other escapements, the bascule, but did not explain just what it was or how it operated. Can you enlighten me as to just what the bascule escapement is?

Answer: The bascule is another name for the pivoted detent escapement. In other words, it is a form of chronometer escapement where the detent is pivoted and the hairspring applied similar to the hairspring in a balance to create spring action in order to return the detent to its banked position. In the ordinary chronometers, used for marine purposes, the detent is one piece, the central section being cut very thin so as to have spring action, as the detent itself is held in position by means of a screw. The bascule escapement is generally found in pocket watches.

MJ: Will you please explain where to place the hands on a ship's bell clock, and how one tells time by the bells?

Answer: The striking mechanism for the ship's bell clock is so constructed that one additional bell is struck as time advances. There are six watches on board ship of four hours each during the twenty-four hours. The watches start at twelve, four and eight and the clock will strike thus:

12:30 o'clock	4:30	8:30—one bell
1:00 o'clock	5:00	9:00—two bells
1:30 o'clock	5:30	9:30—three bells
2:00 o'clock	6:00	10:00—four bells
2:30 o'clock	6:30	10:30—five bells
3:00 o'clock	7:00	11:00—six bells
3:30 o'clock	7:30	11:30—seven bells
4:00 o'clock	8:00	12:00—eight bells

HS: Please advise me how to go about re-bluing a gun metal pocket watch case and clock hands?

Answer: Clock hands and other thin flat articles are generally blued by means of heat, being passed over a heated iron or other source of heat until the desired color has been attained. In doing this, it will be necessary to first polish the article if you desire a polished surface after blueing. It will also be necessary to see that they are thoroughly cleaned if you are to have an even color. Workmen who have but little bluing to do, and are doubtful of their skill in this regard, frequently place the article in a flat dish, cover with sand, iron filings or other means of distributing the heat, and expose the article so you can judge the color, then apply heat in an oven until the proper

shade of blue is obtained. In this way the whole article is heated evenly, and the color which depends on the degree of heat, is also even. Heavy articles, such as revolver barrels, are frequently blued by boiling in a solution of hyposulphite of soda and acetate of lead until the desired color is obtained. This solution will vary according to the quality of metal dipped into it, and consequently, experience is the best guide. It is therefore not recommended for occasional use on a single article. Of course, all work must be chemically cleaned and finished to a desired surface before dipping.

* * *

The following letter refers to V.C.N:'s questions that appeared in the November A.H.&J.

Dear Mr. Samelius:

I wish to add a point to the question of V.C.N. which you answered in the November A.H.&J. One of the first points to be considered in a water-resistant watch performing, as V.C.N. states, is the tight fitting crown which sometimes holds the forward winding pressure on the mainspring until such time as the running down of the watch can nullify it. This additional pressure will sometimes also cause the rebanking condition described in the original answer. The best solution I have found so far is to inform the customer that he has a nice, tight fitting crown, and that after winding the watch fully, to back the crown off until he hears a ratcheting sound. If at anytime in the future he doesn't hear the ratcheting sound, it usually means rust has begun to form in the winding parts (the clutch and winding pinion) and he should promptly return his watch to his watchmaker to forestall greater damage to the timepiece. This will probably occur should the customer neglect this little warning. Of course as V.C.N. was originally concerned, the reverse movement of the crown at the end of the winding process will also remove any forward pressure exerted from the crown, and if the recoiling click is functioning properly, will eliminate the difficulty from that portion of the watch.

A. C. HOLMES

c/o Roy's Jewelry
P. O. Box 1268
Ponca City, Oklahoma

The following refers to a letter from R.E.W. in the September A.H.&J.

Dear Mr. Samelius:

The letter by Mr. R.E.W. in the September issue of A.H.&J. was a very interesting analysis of the cause of moisture appearing on watch crystals. There are several facts, however, that should be considered before a conclusion can be made as to the cause of the condensation.

It is true that a certain amount of atmosphere must be sealed into any watch case and that there must be some vapor present in the atmosphere. In the June 1951 issue of A.H.&J., an article by Mr. R. W. Slaugh on "Condensation of Moisture on Watch Crystals" described research performed to determine the moisture content of air sealed in a watch case. This article points out that "If the watch was cased in a temperature of 90 F. and a relative humidity of 90% the moisture content then trapped would be .000065 cubic centimeters," or .0000397 cubic inches. If all the moisture were condensed into a single droplet you would not be able to see such a small amount.

After considering the small amount of moisture available in the watch case, one must conclude that additional moisture has centered in the case in order to have the condensation on the crystal. Mr. Slaugh's article goes on to describe how moisture was observed to enter the case at the joints and finally appear on the crystal.

The correct procedure appears to be one of preventing the moisture from entering the case rather than from condensing on the crystal. Many times the gaskets have lost their resiliency or have been pinched and must be replaced. And the use of grease in the crown seal will aid in making that point more waterproof.

If a watch were opened to allow the condensation to evaporate, a slight warming of the movement would greatly hasten the evaporation. This could easily be done over a light bulb or other gentle heat which is not hot enough to affect the oil. The heat would especially aid in removing the small amount of moisture held in the cracks by capillary action. But this warming only serves to dispose of the water which has already entered. The only way to prevent it happening again is to replace all gaskets with new ones, so that water cannot get in the next time the watch is exposed to heavy perspiration or other moisture.

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Readers' Contest....Valuable Prizes

Subscriber requests have been urging the American Horologist & Jeweler to revive its Watch Bench Contest Series which were so popular a few years ago. Here's the answer—let's go!

Readers want to know what bench problems you have solved, what tools or methods you have devised to make a particular job easier. NOW—thousands of dollars' value in tools and material as prizes for watchmakers submitting practical bench ideas, experiences or tools. *An acknowledgment award for every entry—whether used or not.*

First Series Prizes: (Deadline Feb. 20, 1954)

1. **Watch-Craft tweezer and plier set; Swiss-made 5 tweezers and 3 pliers in handsome wood cabinet.**
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3. **Algren spring bar kit; double flange, 72 assorted sizes.**

How It Works:

Send in one or more entries to Contest Dept., American Horologist & Jeweler, P. O. Box 7127, Capitol Hill Station, Denver 6, Colorado. A prize, material for the most part, will be awarded to the sender of each entry.

Each entry, as received, will be awarded a number for impartial judging. Names of 1-2-3 winners will be published upon receiving prizes; 1st prize winners shall be eligible to compete for Grand Annual Prize. Publication of entries shall appear at discretion of the Editor. All entries become the property of A. H. & J. and cannot be returned.

First judging ends February 20, 1954.
Entries should be mailed before that date.

JUDGES: W. H. Samelius, Dean of American Watchmakers, Editor "Information Please," A. H. & J.
J. E. Coleman, Foremost Clock Expert, Editor "Clockwise and Otherwise," A. H. & J.
Henry B. Fried, Horological Instructor and Author, President of Horological Society of New York.

First Contest Series Ends February 20, 1954.

Mail Your Entry NOW To:
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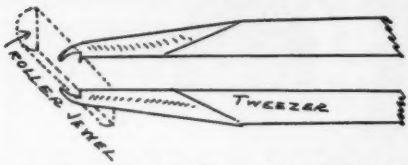
Here Are Examples of Entries From Previous Contests:

Roller Jewel Setting Tweezer

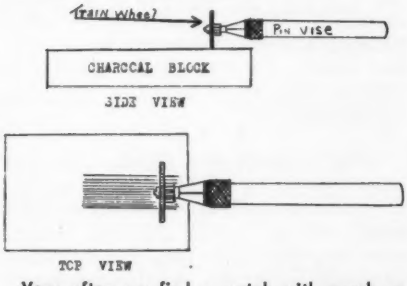


Every watchmaker knows that the job of replacing the broken roller jewel is one of the most difficult because the roller jewel is so small and slippery it gets lost if taken with a regular tweezer. Here is a setting tweezer which has the property of catching the jewel without trouble.

First, prepare any straight tweezer for the tool by taking out the temper. This is done by heating the sharp end till blue in color. Then, cut the sharp end about 1 mm.

Using a half-round needle file, make a cut as designed in the drawing, and your tool is ready. This tool will permit you to catch the roller jewel firmly and fit it on the roller plate in a short time.

Rough or Burred Teeth



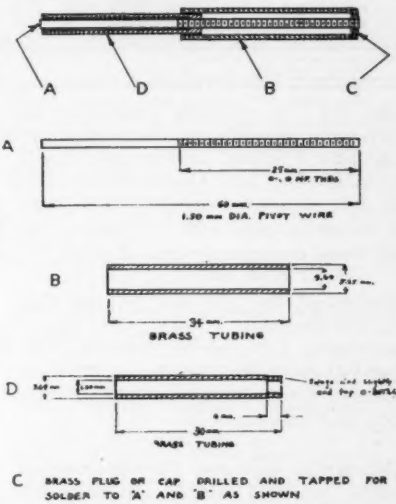
Very often we find a watch with rough or burred teeth on train wheels, or sometimes even on the barrel, a little worn place on sides of teeth caused by a pinion cutting it. Sometimes there is not quite enough depthing and the workman does not have a rounding-up tool.

Fasten train wheel in pin vise; then place wheel on smooth charcoal block; pull wheel sideways lightly with grain of wood in charcoal block. The teeth of wheel will cut little trenches in charcoal block; the charcoal is a very light abrasive and will cut a little off of each tooth as it is pulled through charcoal. After each pull, rotate wheel about seven teeth and repeat the operation, making sure to pull (not push) very lightly and not to rotate too many times as it will reduce diameter of wheel. If done correctly the teeth of the wheel retain their original shape.

If workman wants to do a little more touching up, this can be done by putting a soft bristle wheel brush in lathe, and while holding wheel in pin vise, turn wheel brush slowly, thus brushing out teeth of wheel. A little tripoli can be rubbed on wheel brush.

By using this method, there is no danger of leaving cutting compound either embedded in metal nor loose in watch.

Comparison Gauge



A. 1.50 mm. pivot wire, 60 mm. long with threads 0.80 on one end extending 25 mm.

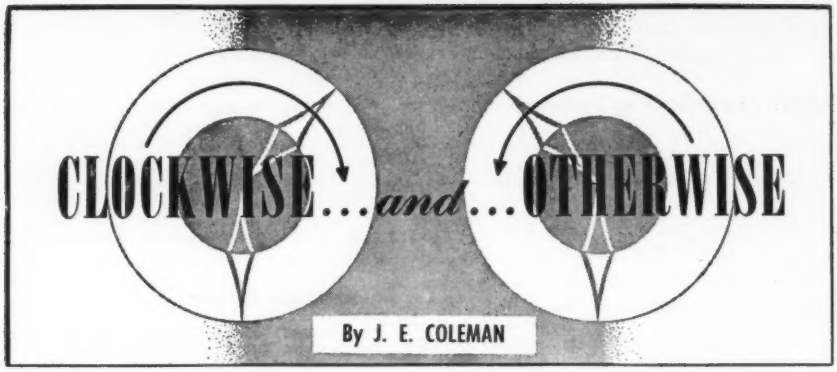
B. 5.25 mm. brass tubing, 34 mm. long, center opening is 3.64 mm. and will receive "D" snugly.

C. Small brass plug to fill the end of "B," drilled and tapped to receive "A," 0.80 thread.

D. 3.65 mm. brass tubing 30 mm. long. Hole diameter is 1.50 mm.; this will receive "A" before "A" is threaded. The threading will decrease the diameter of "A" so one end of "D" will have to be shrunk slightly so it will take a thread that will match the thread on "A."

To assemble after pieces are cut and threaded, screw "A" into "D" until all the threads are exposed out of the threaded end of "D," then push into "B" until a small amount of the threaded end of "A" comes out of the other end of "B." Place plug "C" on the end of "A" and draw back into "B," then apply soft solder on this end making "A," "B" and "C" solid here.

Remember—A Prize for Each and Every Entry!



OTHERWISE

Jan and I are especially grateful for the many cards and Christmas remembrances. They were a definite addition to the holiday spirit. It is truly heart-warming when men take time out from their busiest season to send a good wish to someone they only know through the printed page.

* * *

Otherwise the mail was on the light side, for December is usually the lightest mail month of the twelve. Nice long distance call from Mr. Blanchat in Wichita, Kansas, and talked long distance with Carl Hurst in Oklahoma City.

* * *

Mr. Arthur Tremayne (The Horological Journal, London) writes: "I notice the reference to an Elliott clock in your column this month. The firm is still in business, the grandsons of J. J. Elliott are in charge with a factory at Union Road, Croyden, and offices and showrooms at 107 Hatton Garden. They are well known here. No doubt Mr. Horace Elliott at Croyden would probably give your reader particulars of his clock, although the question of value is difficult—the number may be of some line as to age. The address at Percival Street certainly is.

"My first memories of J. J. Elliott go back to about 1908 when he was in Great Sutton Street, Clerkenwell. Later he went in partnership with Grimshaw & Baxter, and the firm continued until about two years ago as Grimshaw, Baxter & J. J. Elliott, Ltd., although Mr. H. W. Elliott, the son of J. J., left this company and founded the H. W. Elliott & Sons, which is the present firm. They make a very high-class English clock, and as a specialty they make their own cases as well as movements which very few firms outside the Black Forest do. They have a very live agent in the U. S.—Mr. Lionel Plimmer, trading as the Worcester Silver Company, New York."

This is splendid cooperation and we appreciate it a lot; in fact it is the first time we've gotten the Elliott firms in correct order, etc. Baillie's list stops at 1825, thus we over here are at a loss to locate firms like Elliott. I'd certainly be grateful to someone who would bring the listing up to, say, 1925.

* * *

While on horological literature, just one other thought—a bit of proof in support of what we've said in these columns many times, and we'll make the first "Otherwise" for 1954 a brief one. We have often lamented the fact that so little attention is, or has been (in recent years) paid to horological writings. All my life I've been told, and on good authority, too, that "Lessons in Horology" ("Horlogerie Theorique," the French title) by Jules and Hermann Grossmann, was never completely translated into English; that Mr. James

Mr. Coleman invites your questions. If your question requires a direct answer, please enclose a self-addressed, stamped envelope. It is impossible through correspondence to give valuations of antique timepieces; questions of this nature cannot be answered

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● SITUATIONS WANTED

WATCH MATERIAL and TOOL SUPPLIER: We would like very much to be your supplier. We will gladly send you our latest catalogs and a free comb.nation Movement and Springbar Gauge on request with your order for any item on this page. ★

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Allan, Jr. (Charleston, S. C.) a former pupil of theirs in the Le Locle, Switzerland, school, was authorized to make the translation, and that he completed Volume One, and it ran serially in one of our trade journals from January, 1904, through December, 1905, at which time the journal brought it out in book form. Mr. Allan died before getting into Volume Two.

Now, I find that Volume Two was started in serial form in March of 1910, but owing to some missing issues in the middle of 1911, I lose track of the serial, and when my file takes up with the July 15th issue of 1911 (they began publishing twice monthly, the 1st and 15th in July) there is no serial or later mention of it. In the past ninety days, we've written upwards of forty letters trying first, to ascertain just how far the translation actually got, and second, to locate the missing issues; no luck to date.

These inquiries included the journal (still being published) and Mr. Allan's son. Mr. A. N. Allan writes: "We have been unable to locate the information you desire"; practically the same answer from the journal. Mr. James Allan died December 9, 1914, some fifty-six months after the first installment of Volume Two started, and isn't it reasonable to suppose that one so enthusiastic about this great work completed it in that time? Did he? Was it published serially? In book form? No one seems to know.

At the completion of the Volume One serial with the December, 1905, issue, there was a half-page advertisement announcing that, "Volume One is now ready, $1.50 postpaid. Volumes Two and Three will be published as soon as the translations are ready." From the best I can learn, there was no Volume Three in either the French or German. Was Volume Three in the ad an error? Or did the journal plan to break Volume Two into two parts, either because of length or the fact they had already established the price of $1.50? Again, it's anybody's guess.

The main point is, all this took place only forty short years ago; it certainly marks an important milestone of horological publication in America, yet at this date no one knows. Why? The only answer is we just don't pay enough attention to horological publications.

* * *

We "view with alarm, and point with pride," we talk long and loud about elevating the trade, about placing it on the high plane on which it rightfully belongs. Here's my thought for 1954—the trade can't be elevated or even helped without literature, without the writings of the old masters (and of the new). If you don't plan to read, then for goodness sake throw your loupe away and get a shovel, or start driving a truck.

J. & J.

CLOCKWISE

Dear Mr. Coleman:

I have a battery driven impulse pendulum clock of German manufacture. All the information on the clock is Riefler Munchen No. 374 and D.R.P. 50739. I am enclosing two photos of the clock, a front and a side view. The clock will only run for about an hour. Any information you can give me will be very much appreciated, particularly about the escapement.

VINCENT MIELE

Inst. Cal. Section
Phy. Test Lab., Bldg. 525
Aberdeen Proving Ground, Maryland

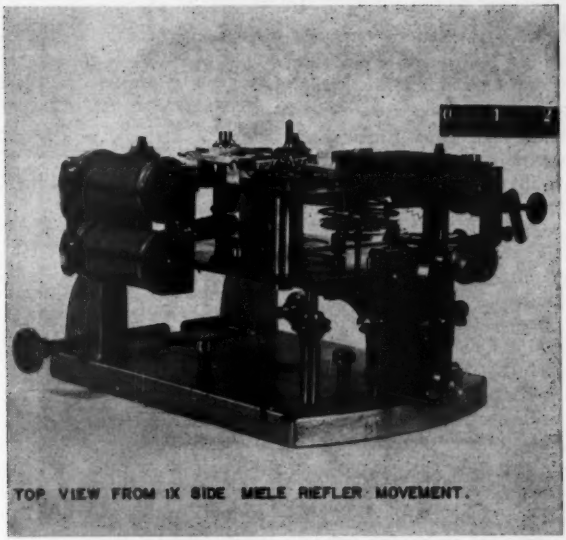
Dear Mr. Miele:

Thank you very much for the fine photos; the work is excellent and you thought to include a scale. They are the best prints of this particular movement we've seen to date.

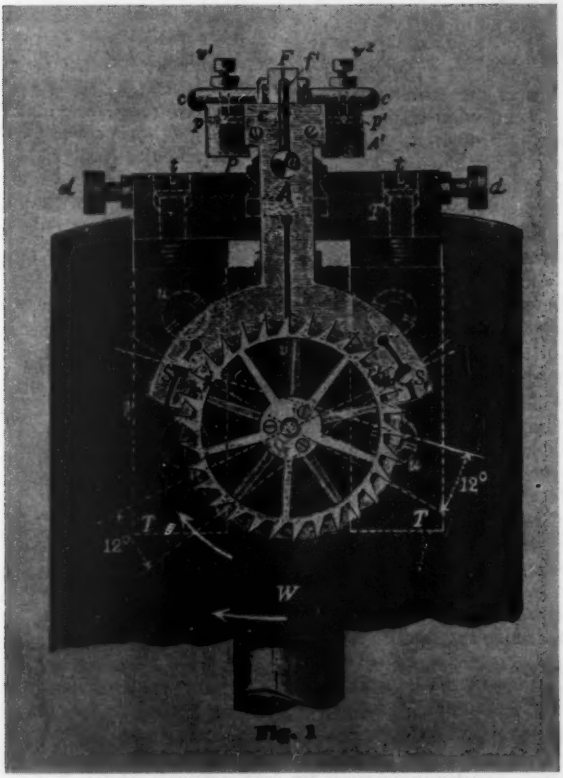
This is a pretty big order, and I can assure you that, regardless of effort or length, our answer will be far, far from complete, but never let it be said that old C. & O. did not make a try.

Before getting into a meager description of the escapement and its action, allow me to suggest that you study both it and your clock closely, then reduce further questions to specific points. Mr. Hamilton Pease, 51 Empire Street, Providence 3, Rhode Island, and Mr. H. E. Reum, 1103 Woodbine Avenue, Oak Park, Illinois, both have this type clock in operation and I am sure would be glad to assist on specific points.

Aberdeen is, I believe, very near Washington, D. C., and if convenient, I suggest you contact in person, Mr. John Early



TOP VIEW FROM IX SIDE MIELE RIEFLER MOVEMENT.



MIELE ILLUSTRATION OF RIEFLER CLOCK

jackson, 4440 "Q" Street, for I am sure he can supply any answer on the Riefler clock.

This is generally called the "Riefler Free Pendulum" precision clock, and its very high accuracy is attained because its pendulum receives the impulse through its suspension spring and is, therefore, as free as a mechanically propelled pendulum can be. Oddly enough, the thought is prevalent that Sigmund Riefler originated this idea, possibly because he patented it in Germany shortly before the turn of the century. It rightfully belongs to Abraham Louis Breguet (1747-1823) who made a fine clock with its pendulum so impulsed for the royal house of England nearly a hundred years before Riefler began using it.

Let's take three views—front, side and top—of the Riefler clock and split its workings three ways. 1. How the pendulum is impulsed. 2. Description of the escapement parts. 3. Action of the escapement.

One: In this clock the pendulum swings perfectly free, being connected with the clock work solely through its suspension from which it receives the impulse; this impulse being communicated in the axis of oscillation and at the instant when the pendulum swings through the dead point (center of gravity). The impulse is imparted by the escape wheels bending the suspension spring a little at each oscillation of the pendulum, which produces a slight tension in the spring. This tension-force of the suspension spring gives the pendulum its impulse.

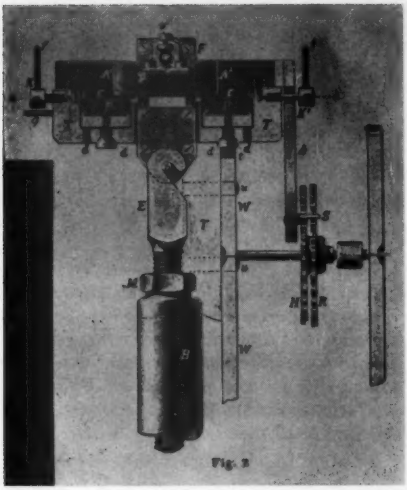
As this bending takes place around an axis which is identical with the axis of oscillation of the pendulum, and further, occurs every time at the instant in which the pendulum is swinging through the dead point or center of gravity, there is gained thereby perfect freedom of the pendulum and also the great advantage that irregularities in the communication of force from the train and escape wheels, and resistance to the escape can exert no detrimental influence on the uniformity of the motion of the pendulum.

Two: T.T., figures one and two, is a heavy hanger of brass securely fastened to the back plate of the movement W by means of four screws uu; the flat and highly polished agate stones PP which are in a perfect horizontal plane and form together a bearing between which is the opening for the suspension spring FF′. On this horizontal plane or bearing is the axis aa of the verge or anchor AA′, of which the knife edges CC′ form the axis. The screws KK center the verge so that it engages properly with the escape wheels H and R. These screws are withdrawn slightly after the pendulum has been hung in position so as to allow the verge to act freely on the knife edges without friction on the points of KK′.

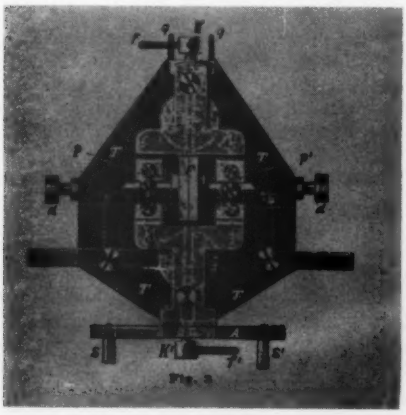
FF′ is the suspension spring resting on the verge of frame AA′ and the springs ii, the axis of which coincides exactly with the axis of motion of the verge. The escape wheel is a double wheel composed of an impulse wheel H, and a somewhat larger-locking wheel R. The teeth h and h′ on the wheel H are cut tangent or ratchet-shaped, and do the lifting or make the impulse, and the teeth r and r′ on the larger wheel R, do the locking. S and S′ would be the lifting and locking pallets of the anchor or verge—these are cylindrical and the front ends are cut away to the center of their axis just like the pallet stones of the Brocot escapement.

The verge receives its lifting motion on the cylindrical part of the pallets from the teeth of the escape wheel H, and the locking is accomplished by the teeth of the wheel R resting on the flat (cut away) portion of the pallet stones.

Three: For the action of the escapement, refer to Fig. 1. The instant the pendulum is on or near the center of gravity, the tooth r of the locking wheel R is locked on the pallet S. If the pendulum swings in the direction of the arrow (the left), then the suspension spring ii, being vertical and taut by weight of the pendulum, follows its swing and causes the verge A to swing or turn on its knife edges owing to its being on the same axis aa (see Fig. 2), and attached to same to also follow the swing of the pendulum until the pallet S′ has passed the tip of the locking tooth r, disengaging itself. When accomplishing this, the pendulum has described an arc of approximately one-quarter of a degree. By this time the cylin-



drical part of the pallet S has approached and been engaged by the inclined plane of the tooth h′ of the ratchet type impulse wheel H, up to the necessary nearness for play or drop, and has been raised by the revolving of the escape wheels; (in Fig 1, the wheels revolve in the direction of the arrow, clockwise) until the locking tooth r′ of the wheel R has engaged the flat face of the pallet S′, the action of the tooth h′ on the cylindrical part of the pallet S′ raising the pallet and moving the verge A to the right; this causes a slight bend in the suspension spring through the axis aa to the right. This slight bending of the suspension spring has taken place before the pendulum has made its full



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swing to the left, and on its return swing to the right, gives it a slight impulse or motion to the right, the same operation of the suspension spring carrying anchor A with it disengaging the pallet S′ from the locking tooth r′ and receiving a new impulse through the tooth to the left. It is quite evident that these impulses are very gentle and gradual, and makes really the ideal escapement for precision pendulum clocks. To avoid any confusion, I should point out that the screws d of Figures 2 and 3 are to clamp the lower chock of the suspension F′ secure so that the pendulum can be put on or taken off without damage to the suspension spring, and that they have nothing at all to do with the escapement or its adjustment.

As I said at the outset, this is only the starter. I hope that it may get you off on the right track. If you feel that C. & O. may be of further help, you know you have only to drop that line.

J. E. C.

Dear Mr. Coleman:

I talked this evening with Mr. A. P. Schwope and he suggested that I get in touch with you for a possible solution to my problem. For the past few years I have been accumulating the necessary tools and equipment for repairing the large-sized music boxes and clocks. I have now on hand a very good wheel cutting setup consisting of a Derbyshire lathe, milling attachment, index plate, plus a set of collets including step collets for clock wheels. Of late, the idea of making a clock movement has taken over my thoughts, and I am going to start as soon as I can obtain a few more items. The problem of depthing without a depthing tool is too much for me, and that is the main reason I am writing to you. Mr. Schwope thought you might be able to refer me to someone who could supply me with a reliable one, of a size capable of depthing the wheels for a second pendulum hall clock, which is the size I intend to do for my first one. I am going to include a strike works, as I have no use for a clock without such a feature.

The problem of pinions has given me some concern, as my lathe is driven by a round belt which lacks sufficient traction to turn a cutter slowly enough for steel. I can and will get V-belt pulleys for the motor, countershaft, and headstock, but they do not supply such a pulley for the milling attachment because of lack of room apparently. For now, I will purchase pinion blanks, if such items are to be had, and I think I can work them to the required size and shape if not too much stock is to be removed.

While I can slit the wheel blanks with a saw, and shape them up with a fly cutter, I would prefer obtaining a set of milling cutters to do the job. I am setting up a relieving attachment to enable me to make my own, but this will not be completed for some time, and I have decided to purchase my cutters for the first one at least. Can you refer me to someone who can supply me with such cutters?

I think that should be sufficient questions to ask in one letter, and I will be very grateful if you can help me obtain these needed items.

F. R. CRAWFORD
1218 North Victoria Street
St. Paul 13, Minnesota

Dear Mr. Crawford:

Write Mr. William A. Phelps, 4106½ Glenway Avenue, Cincinnati 5, Ohio, for his catalogue on Cycloid milling cutters. Since you are as far west as Minnesota, you might also write Eureka Time Instruments, 35 Wabash Avenue, Eureka, California. Evidently you have the time, so why not go ahead and make those pinions? When the final clock is set ticking, the more of it that you've actually made, the more you will appreciate it. Some time and effort will be required to lick the pinion problem, but if you have it, I'd say try. In this very mail comes what appears to be a very practical method of building a simple attachment for relieving hobbs on the lathe, from Mr. Paul Blanchat of Wichita, Kansas. Since it will be a couple of weeks before I can give it serious attention or make practical use of it, I am loaning it to you, and when you have finished, please return it to me.

It is my thought that you should not encounter any trouble with a round belt on the cutter. It should be leather and of the proper size to fully fill the pulley. You can always resort to using a little belt dressing on it. Have you seen the new splicer

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advertised by Louis Levin and Son, 782 East Pico Boulevard, Los Angeles 21, California? With it you can make your leather belts the practical equivalent of endless belts. Possibly some of our readers might have something to say on your pinion problem. I was about to overlook the depthing tool. Write to Mr. Charles A. Kuhn, Garfield Avenue and Albany Street, Schenectady 4, New York. He is manufacturing and marketing a splendid clock depthing tool.

J. E. C.

Dear Mr. Coleman:

I have an old porcelain French clock which my customer wants fitted with a new electric movement. The largest size movement it will take is 2½ inches in diameter. Can you tell me where I may be able to obtain such a movement.

BILL LINDSEY
207 Morley Avenue
Nogales, Arizona

Dear Mr. Lindsey:

You won't be able to find a synchronous electric (plug in the house current) clock movement small enough to go into your little china case.

There is currently being marketed an excellent battery electric clock movement just right for your problem. It is a jeweled movement, well built and an excellent timekeeper. Write to Mr. A. S. Lissance, El Products Corporation, P. O. Box 41, New York 63, New York.

J. E. C.

Dear Mr. Coleman:

I'm writing in question of our old Seth Thomas eight-day clock. We've had our clock over to Mr. Hainse, and he suggested we write to you, as we would like to find out how old the clock is. The outside cabinet is seventeen by twenty-nine and one-half inches, and has one door with a divided glass. The top half is plain, but the bottom half is about seven inches square with scrolls and leaves in a square design, and in the middle is a four-inch wreath of flowers. Down by the pendulum is a second bunch of springs, scrolls, etc., about seven by two inches with an oval in the center. It has solid brass work in lyre shape, and has no date that we can find; on the inside of the back behind the pendulum are instructions on how to adjust the weight of the pendulum. I am enclosing a small sketch of our clock so it will be clearer to you how it looks. It is a family piece, and we would like to pass it on to our children with some idea as to its age. I am also enclosing Mr. Hainse's card so you can contact him if you wish, as he did some repair work on the clock just a short time ago.

MR. AND MRS. TOM GOODIN
Route No. 1
Hillsboro, Oregon

Dear Mr. and Mrs. Goodin:

Glad to hear (indirectly through you) from watchmaker Hainse, and wish I could supply you with an answer that will satisfy him.

Your sketch is excellent, and so is your description, but case sizes, decorations, etc., aren't very much of a key to age. I do know that the lyre-shaped brass movement was being manufactured as late as the 1890's and believe that it came on past the turn of the century.

The address of your label could be one key. If it is Plymouth Hollow, Connecticut, it would indicate that the clock was

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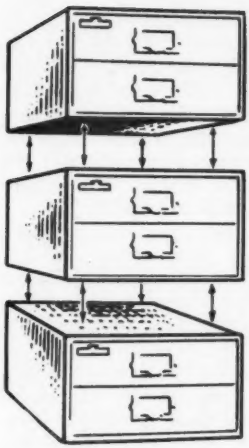

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made prior to 1866, and if it is Thomaston, Connecticut, after 1866. Another indication might be the printer. Look at the very bottom, right corner, for mark of the label printer and jot his name and address on the enclosed, addressed card and we shall see if a more exact dating can be made.

J. E. C.

Dear Mr. Coleman:

I am writing you in regards to information about parts for a watchman's clock. Enclosed you will find a letter that I received from the manufacturers saying that I should send the clock to them for repairs, after asking them for these parts.

This is the first clock of this type I have received for repairs, but can expect more later. They say the registering part must be checked also, and that we as watchmakers are not able to take care of this—or they imply this as you will see on reading this letter.

I believe that in most cases the registering parts they refer to do not need replacement, only cleaning, as in this case. The clock I have was repaired; the pivot was partly broken off and was corrected by pressing the cock balance jewel lower and putting an extra cap jewel under the regular cap jewel. I want to replace the staff and put it in its original condition.

My question is, where can parts for these clocks be obtained? I have been a reader of your column for about seven years, since I went into the watch and clock business. I enjoy it very much and have gained much from it. Thanking you for this information.

FRED L. YODER

4521 Erie Avenue
Sacramento, California

Dear Mr. Yoder:

Evidently these people do not intend to sell material to the clockmaker. If that is their policy, it's their policy—period.

Fortunately, good clockmakers are not wholly dependent on the maker (or importer) of any timepiece for their parts. As you well know, jewels, staffs and hairsprings are probably the most required. Friction jeweling solves the jewel problem. Either a new friction jewel is crowded in, or if the hole be extra large, you friction jewel the old brass setting or make a new setting. There are a number of shops over the country making a specialty of special staffs to sample, and the same goes for hairsprings. Count your train, send in the balance wheel (and bridge) and ask for a spring to be vibrated to that wheel to the correct count. Sending along the bridge gives your vibrator the correct diameter of the required spring.

The condition you describe this clock to be in is the excuse manufacturers usually hold up for withholding their material from the trade, saying that local clockmakers wreck their clocks, etc.

Now I'll be the first to admit that our trade has a goodly percentage of "botchers" and "butchers," and I'll be just as quick to say that they (the factories) also get their share of poor mechanics. I've seen some "lulus" come back from these factory overhaulings. Simply because they may have the material at their fingertips does not necessarily guarantee that the mechanic using that material has the ability to, or does, install it properly.

As you well know, this column has constantly advocated membership in The United Horological Association, guild activities, and about everything one could think of to weed out the "botchers," improve the trade, etc. Frankly, I have no particular feeling for the firm (its hotels, banks, factories, etc.) using watchman's clocks who cannot locate a reliable, competent repairman near them. To do so would require but the smallest intelligent effort on their part, and if they can't exercise that little effort, they deserve to have "butcher" work. Chances are they pay dues to the local Chamber of Commerce or some similar organization who would gladly spade up the information at a phone call. On the other hand, I place a portion of the blame on the clockmaker. It's up to him to make some "noise" and let his fellow townsmen know where he is and what he does. The old saw about the mouse trap definitely does not apply in this atomic age. You may do a better repair job, but John Q. Public will not beat a path to your door unless you remind him where your door is. You do the good repair job, the timepiece does not give trouble, and John Q. immediately forgets you or where you are. He is leading a busy

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life, automobile travel, lodge and church duties, television and millions of other things to occupy his mind. And of course you are forgotten when that piece needs servicing again three, four or five years hence.

Personally, I feel that in some instances where they refuse to supply material, there is an effort on the part of the factory (or distributor) to cinch a repair business, and I don't like it. A lot of clockmakers do not realize that many dollars go out of their town for clock repairs which they, as local tax-paying citizens, ought to be getting. Bakeries, milk-pasteurizing plants, candy factories, etc., use recording clocks and send them out for servicing. The most unfair angle is every time they get caught short, they fall back on the local clockmaker to work them out of their jam. Again the clockmaker is fortunate enough to do something about it. I flatly refuse to drop everything and pull one of these jokers out of the hole while he sends the "cream" of his work to some distant city—it doesn't make sense. On the other hand, I feel a definite obligation to the man or firm who favors me with all his work (be it small or a lot) and will go to any reasonable lengths in case of an emergency, be it a midnight call or just one after hours, to get his clock back in service.

Every guild has several members who would like this work, and I've often wondered when I hear guild officers lamenting the lack of material for the monthly meeting, why they do not make a survey of the work going out of the community then do something about acquainting local firms about the services they have to offer. This could also be one of the answers when a prospective member says, "What can the organization do for me?" I care not if he be a watchmaker specializing on the smallest ladies' wrist watch, if and when the many dollars that have been siphoned off out of town are plowed back into the repair industry of his community, it will help him in some manner.

J. E. C.

P. S. — Burton M. Reid Sons, Inc., First and Washington, Springfield, Illinois, make a specialty of staff duplicating—one-day, airmail service. Any material house can supply Seitz friction jewels, and you

will find hairspring vibrators, clock bushers, and many other services offered in the ads of A. H. & J.

Dear Mr. Coleman:

As a subscriber to A. H. & J., I enjoy your Clockwise and Otherwise each month, and have written you once before about handling mainsprings in barrels. I am retired and do watch and clock work as a hobby.

I am working at present on a tall clock which has the name of Robert MacNab, Perth, on the dial, and the cast iron intermediate plate between the dial and the upper plate of the movement has Patterson, Perth, cast on it. The dial is different from any I have seen in any of my travels or in any of my books. (See sketch.) Can you give me any idea of the age of this clock?

What do you advise for replacement of cords in antique shelf clocks with wooden or brass works driven by weights? I have used brass cords with good success but perhaps catgut or fishline would be better. The moon is on a disc about three inches in diameter paintd with blue sky dotted with stars, and one moon. This disc apparently makes a complete revolution every twenty-four hours. I can figure no way to set this so that it will show the phases of the moon as it travels too fast and the window in the dial is only about one-third of the day of the month dial. It looks to me as though it was just for novelty, although this does not make sense as the old clockmakers usually had a reason for everything they did. Any information will be greatly appreciated.

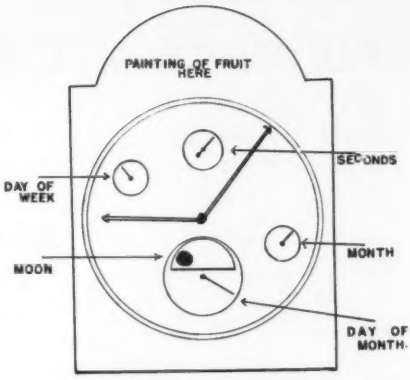
H. R. CHADSEY

1 Reynolds Street
Wickford, Rhode Island

Dear Mr. Chadsey:

We shall certainly have to pass out a "rain-check" on this one all around. No Robert MacNab of Perth is in any of our lists, and Patterson we did not expect to find listed because the name found on the iron support frame always indicates the iron foundry that cast it.

At one period in English clockmaking, it was quite the rule for various artisans to supply parts to clockmakers. Ironmongers, I believe the casters of iron parts were called, supplied the iron dial support frame and sometimes the sheet iron on which the dial was painted, thus the various ironmongers placed their names on the parts they supplied.



SKETCH: CHADSEY'S MACNAB DIAL

I shall ask friends George T. Hogg and Archie McGhee for some help on clockmakers of Scotland. Your pencil sketch of the dial has been done in ink and we hope that some of our readers may have something on the workings of this moon mechanism. I don't recall a grandfather clock with moon action on which the moon disc revolved once per twenty-four hours and would especially like to see a train count of this moon disc train. Certainly if you have an aperture of slightly less than half the circle and the disc behind revolves once every twenty-hour hours, it could not possibly indicate moon phases.

We have had good satisfaction from a metal cable for shelf weight clocks made by John Roebling and Sons Company. It is 4 x 7, 3/64th, meaning four twists of seven strands each, total diameter 3/64-inch diameter, obtainable from most supply houses.

J. E. C.

Dear Mr. Coleman:

I am writing to you at the suggestion of my jeweler, Mr. Joseph Progner, Suite 1237, 105 West Adams Street, Chicago, Illinois. I have an old watch which I inherited some years ago, and would like to find out if, in your opinion, it might be a collector's item. Following is the perti-

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nent data regarding it:

Manufactured by Home Watch Company, Boston, Massachusetts; Watch No. 656793; case No. 1860; case is a "hunting" case of heavy coin silver; watch is size 18, 15-jewel, key wound (key is lost). To set the hands, there is a square on top of the base of the minute hand for which a key is apparently needed to put in operating condition. The watch needs cleaning, two hands (second and minute), new crystal, key to wind, and key to set. In the center of the inside of both the front and the back of the case is an insignia, and in the center of the inside of the inner back case is the insignia: 1860.

5

R. F. STONESIFER
1207 West Leland Avenue
Chicago 40, Illinois

Dear Mr. Stonesifer:

The Home Watch Company was a name used by the Waltham Watch Company. Mr. Brooks Palmer records that movement, No. 5190283 was made about 1868, but since yours is No. 656793 it might indicate that it was made a bit earlier.

The regular Waltham serial numbers are supposed to have begun with the five million series about 1895, thus it would seem that the Home Watch Company's numbering is not directly proportioned to the ones used on Waltham's.

Mr. Palmer further says, "Not old enough to be among the American-made watches considered to be rare. Value possibly only in case in collector's market." Glad to help watchmaker Progner identify your watch. Have him check the winding square and the hand-set square. We believe that one and the same key will both wind and set the watch.

J. E. C.

Dear Mr. Coleman:

I have recently resurrected an old clock out of my smokehouse that was put there in 1912. Needless to say it was in foul shape. After removing the accumulated grime of all these years, and no telling how many coats of varnish, I uncovered a beautiful curly walnut case 19 x 11 inches. I have had it reconditioned by a local watchmaker and it keeps time like a 21-jewel Elgin. On the back of the dial is written, "Repaired by George L. Becun,

Gaston Co., N. C., Jan. 6, 1811," and on the face of the dial, "E. C. Brewester, Bristol, Connecticut."

The springs in this clock are located in the bottom of the case and there is a trigger you can touch and it will always strike the nearest hour. Will you please tell me how old this clock is? My many thanks.

KARL M. COOK
Mt. Pleasant, North Carolina

Dear Mr. Cook:

Elisha C. Brewester was among the very first American clockmakers to make use of the coiled spring, and his early springs were brass, not steel. Check with your repairman and see if your springs are not brass.

According to tax records, he was in business on Race Street in Bristol, 1840 to 1843. Shaylor Ives was in the firm and it was sometimes known as Brewester & Ives. In 1844, it became Brewester & Ingraham, when Elias and Andrew Ingraham joined the firm.

The count wheel type of strike mechanism was being used almost exclusively by U. S. clockmakers then, but Brewester used the "rack and snail" type strike attaching a cord to the trip so that the last hour might be repeated at will. Some of his labels read: "Patent spring eight-day repeating clocks, manufactured by," etc. Another unusual feature of Brewester's clocks was the back plate of the movement; this was cast iron, and in it were large cups or boxes for the springs, all cast in one piece.

A suggestion: If convenient, check the records of Gaston County for the years 1810, 1811 and 1812. There is an outside chance you might get a line on this repairman. It could be that he was a seller of clocks as well as a repairman and had to have a license.

J. E. C.

Dear Mr. Coleman:

I have in my possession a grandfather clock. In repairing the works, I find stamped into the brass, "Wainwright—No. 1." The dial is the date and moon type, painted metal, Roman numerals, and across the center of the face is printed in English—S. R. Warrington, and in Old English—Philadelphia.

There are a number of Wainwrights listed in G. H. Baillie's book, "Watchmakers and Clockmakers of the World." However, the name Wainwright stamped on these works does not give a first name or initial. Is there any way of tracing the history of this clock? I presume a Wainwright manufactured clock works, which S. R. Warrington imported and assembled for his grandfather clocks. Can you add any more definite information?

I am a comparatively new subscriber to A. H. & J. and enjoy your column in every issue. The enclosed clipping may be of interest to you.

NELSON C. B. KRIEBEL
Worcester, Pennsylvania

Dear Mr. Kriebel:

Drepperd's list has J. & S. Warrington of Philadelphia, as being active in the 1820's. In all likelihood your S. R. Warrington, Philadelphia, is the same.

A letter directed to Mr. Carl W. Drepperd, 51 East Forty-Second Street, New York 17, New York, might bring a lead for tracing this maker. Dr. Arthur E. James, West Chester, Pennsylvania, has published a history of the clockmakers of Chester County. We've checked it, and find no "Warrington" in that county. It does not automatically follow that he would have any data on clockmakers of Philadelphia County. However, he might be able to shed some light on what extent English movements were imported, etc.

Thank you very much for the clipping. We appreciate such additions to our files a lot.

J. E. C.

Dear Mr. Coleman:

I have an old Paris clock which I bought at an auction in Sacramento. This is the first antique clock I have ever purchased and I am having difficulty in finding any history or facts about the clock.

Mr. Hobbs, a local watch man, suggested I write you a letter. I would greatly appreciate any help or reference you can give me in regards to this clock. The clock is about nineteen inches wide, twenty-five inches tall, and about eight inches deep, is made of bronze metal with a figure of Father Time, and a female sculpture on top. The clock has gold leaf around the

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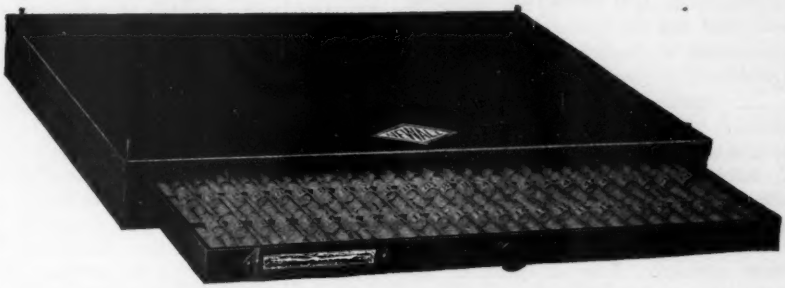

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bottom portion and extending up the sides, a gold leaf serpent around the dial. It has a Paris movement, I think they call it single strike motion; there are two places for winding the clock on the face, and engraved on the inside back of the clock is:
W. P. Pomoli
A. Paris
745

LEO M. O'CONNOR
3918 Fulton Avenue
San Francisco, California

Dear Mr. O'Connor:

We are sorry as we can be. First, we'd like to supply the correct answer to your quiz; second, we'd certainly like to merit the confidence watchmaker Hobbs has in us, but a "W. P. Pomoli" did not get on any of our lists.

France did a brisk clock export business during the first half of the last century, and it was about 1810 that Mr. Frederic Japy established a factory at Badrel for making clock parts. It is reasonable to suppose that other similar establishments sprang up with the boom in clocks. This enabled many men to get into the clock business; they simply purchased parts and cases, possibly gave the finishing touches to the movement and installed it in the case. Thus they weren't "makers" in the true sense of the word and did not get listed.

Some of these movements got into very fine case; most of the better French cases were signed, and there is an outside chance yours may be one of these signed cases. Have you examined it closely for markings? If you can locate something definite drop us a card and we'll make another try.

J. E. C.

Dear Mr. Coleman:

I think I am going to stick you on this one. I have recently acquired an American watch made by J. M. Heywood, of Winchendon, Massachusetts—that is the legend on the dial. It is approximately 18S open face, key wind and set, has an ornate hand-engraved balance cock with an uncut diamond for cap jewel, and a bare balance wheel (no timing screws). It also has the maker's name engraved on the pillar plate, and Winchendon, Massachusetts, number

7294. The movement is brass with the exception of the pinions, etc.; it is a fusee movement single roller, side delivery pallet fork with the stones set flush in the fork mounting. If it weren't for the name on the dial and the type of escapement, I would think it English. The case looks English—it's of coin silver, the back opens up like hunting case for winding, the movement hinges out from the bezel side, and it has the usual dust cover that English watches of that period have.

The crystal is half dome and in the middle it has a flat spot, and the second bit is at six o'clock, enamel dial with Roman numerals. That is about all the watch tells me; perhaps you can tell me more. Incidentally, what I'm trying to do is to correctly date the watch. The timepiece is in excellent condition and resembles the Luther Goddard watch in Palmer's "Book of American Clocks," except that the balance cock is solid, not cut away. It is certainly an earlier timepiece than the Jacob Custer watch in the same book. I have checked all the information I have which includes "Time and Timekeepers," "Mrs. Moore's Old Clock Book," Palmer's "Book of American Clocks," etc. Mrs. Moore lists a Mr. Heywood of London as the year 1630, but that is too early for the timepiece, possibly J. M.'s father or other relative.

CARL L. COURSON
6338 West 96th Street
Los Angeles 45, California

Dear Mr. Courson:

It's no trouble to stick us—in proportion to what it would take to cover every name associated with timepieces, we actually have very, very little. Many names and cases such as you describe were no doubt that of the merchant who sold the piece. If you happen to own a bed, corner cupboard or chest of drawers handed down to you by your grandmother or great-grandmother, I'll bet you can't locate the dealer who sold it.

From your general description I'd say you have what we call a Liverpool watch and that it may be approximately 100 years old, chances are less than 100. Is the case hallmarked? If it is, that is your best opportunity for dating. Send us a pencil rubbing of all the marks or sketches of them and we'll send the date. There is a bare possibility that some of our readers in the vicinity of this city (Winchendon, Massachusetts) may have some data on Mr. Heywood.

J. E. C.

Dear Mr. Coleman:

I have been reading your column for some time now, and appreciate very much the help you have given me.

I am interested in designing and making a small clock and would appreciate any help you can give me. My intentions are to make it twice the size of a railroad grade watch and would like the movement to be visible so as to observe the working parts. I intend making the plates much fancier than in an enclosed clock so I'll be able to take extra pride in my workmanship. Do you know where I can obtain any information on designing such a model?

I am also interested in learning a little engraving as I am often asked to do small jobs such as initialing lighters, etc., but I am in no position here in Korea to take up engraving, so was wondering if there are any books which would give me the fundamentals of engraving so I could do these small jobs. Any help you can offer will be greatly appreciated.

PFC. WILLARD FROELICH
U. S. 52228115
30th Ordnance H. M. Co.
A.P.O. 72
San Francisco, California

Dear Mr. Froelich:

Designing a small clock could cover a lot of territory and does. Why not locate an old movement of the type you wish, pendulum or balance, and reduce its size to the size you wish? We have no prints or plans for such and, after all, there can be but little difference between copying a movement and copying a blueprint, especially insofar as originality is concerned.

Making the movement and its action visible can be accomplished in several ways —use a plastic (clear) dial, a skeletonized metal dial or no dial at all, just put the numerals on the front plate. We recall seeing something along this general idea made up from a Baby Ben movement once. The mechanic simply disassembled a serv

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iceable Baby Ben alarm, threw the alarm portion away and proceeded to make it over in a straight line movement. Both front and back plates were lucite (clear plastic) and he painted the numerals right on the front plate. The original pillar posts were used as they were, being already threaded and having fitted nuts on either end made that feature easy as well as making the distance between plates correct. The train was laid out in a straight (vertical) line with the balance coming at the top; holes were drilled into the plates and then bushed with little brass bearings.

The general shape of the finished clock was that of the letter U inverted, thus one straight piece made the base and one curved piece up one side, across the top and down the other side completed it; tiny screws into the plates held it in place and permitted disassembling whenever necessary. Construction of this, in fact any type of "home-made" clock is limited only by the imagination and ability of the maker. One could use friction jewels instead of brass for the bearings, gold plate the train wheels, engrave the balance rim and a dozen other things to "fox" it up. Even auxiliary wheels may be inserted to run idle just to give it a more complicated appearance.

Engraving is somewhat like penmanship —it requires a great deal of practice and therefore lends itself admirably to home study. I am sending you a list of books available through the A. H. & J. book department; shortly we shall mail some other suggestions along this line.

J. E. C.

Dear Mr. Coleman:

In your November issue of the American Horologist, on page 48, you printed a letter from Mr. Finney of St. Petersburg, Florida, telling about a clock made by E. N. Welch, with twin spring, three glass sides, which you call the "Patti" clock. I believe that this particular clock is in my collection and I am extremely interested in the information about it. Would you be kind enough to send me a copy of the article about it in the May, 1948, Clockwise and Otherwise, and also the photo?

I am enclosing a snapshot of a Henry Terry clock which I have. As you can see, it has a large metal eagle on the top, and measures about 18 x 45 inches. The clock

paper says it is an eight-day. I bought it without the movement, but it has pulleys at the top, paw feet, and pineapples at sides.

If you have any information on this clock, would you kindly let me know?

I cannot praise your column enough. I look forward to receiving it each month, and was very excited when I read the letter on the "Patti" clock.

MRS. ANNE GRUND

196 Mason Terrace
Brookline, Massachusetts

P. S.—If you wish to retain the snapshot, please do.

Dear Mrs. Grund:

The editorial office informs me that the supply of May, 1948, A. H. & J. has been exhausted. They did not have one for Mr. Finney, but give me a little time to dig the negative out of the file and I will mail you a photo-print. I shall copy the vital points of the "Patti" clock article and send same to both Mr. Finney and yourself.

I can't recall ever seeing a Henry Terry, eight-day case with metal eagle; several with carved wood eagles, but none of metal. For this reason, I shall take advantage of your P. S. and keep the photo in the file. If we had enough H. T. eight-day case photos, possibly some definite pattern could be established. Have you checked to see if there are any indications that this metal eagle is a substitute or has been added later?

In 1870, Mr. Henry Terry published a small pamphlet (19 pages) titled, "American Clockmaking." This booklet has been reprinted at least once and there is a good chance a copy may be in your local library.

Henry Terry was the third child of the famous Eli Terry; he was born at Plymouth, November 12, 1801, and died at Waterbury, January 7, 1877. His father began teaching him clockmaking when he was thirteen, and he was later in the firm Eli Terry and Sons. He started business under his own name about 1824 at Plymouth, but gave up the clock business in 1836 and started a woolen mill below what is now Thomaston. His woolen business was liquidated in 1868 and he moved to Waterbury.

If ever he used brass movements in his clocks, I do not know of it. The eight-day H. T. clocks I've been privileged to examine were wood, and my guess is that your case was originally so equipped. Possibly if you could compare the markings inside this case with some eight-day, wood movement shelf clock, you could recognize where a wood movement had been installed. A clock repairman familiar with eight-day wood movements ought to be able to point out any indications now existing. Pineapple carving and claw feet would bear no relation to what the case originally contained in the way of a movement, as these were popular styles with the wood-carvers throughout that period.

J. E. C.

Dear Mr. Coleman:

I would appreciate some information you could give me. Two months ago I took in a striking Concord easel clock, No. 83, to be repaired. Several parts of it had to be sent away to have two wheels made up, and I also sent the plates. In the course of transportation the movement came back smashed beyond repair. Would you possibly have a new or used movement or maybe an uncalled-for clock with the same movement that I could purchase?

J. C. MEYER

102 Elmwood Avenue
Buffalo, New York

Dear Mr. Meyer:

Sorry, but we do not readily identify a "Concord" No. 83, easel striking clock. Has this clock a manufacturer's name or mark on it? Possibly a good chance would be to try Mr. Robert Moses, Bonded Messenger Service, Box 13, White Plains, New York. Another possibility would be Mr. Ernest Giles, 94 Lower Fedder Street, Hudson Falls, New York, or Mr. C. A. Stemmer, 1624 Bennett St., Utica 4, N. Y.

We never have movements or parts for sale, and the above three addresses are those we have nearest to you. If you have to go farther, you might write Raymond S. Behrle, 4142 Deyo Avenue, Congress Park, Illinois, or Clock Manor, 1901 East Colfax Avenue, Denver 6, Colorado. These old and odd movements are very hard to come by and one must try every angle to locate one. If you fail, you might drop Clockwise and Otherwise a line.

J. E. C.

The Editor:

I saw in the last October issue of A. H. & J. the account of a watch that was presented by President Lincoln to Rev. James Kekela in 1864, and it brought to mind a similar event.

In 1924 I visited Canada, and while browsing through an antique shop in Quebec, came across a solid gold 18K hunting case, stem-wind watch with the following inscription: "The President of the United States to Captain Baptiste Carbouneau for the rescue of the crew of the American Schooner Joshua A. Sanborn, 1865. Abraham Lincoln."

At that time my means were very limited and I did not buy the watch, even though the price was only $35.00. If this watch could be traced, it would be of considerable value to a collector today.

At the time I saw the watch, it was in the possession of H. J. Gale, Old Curiosity Shop, No. 5 Haldimand Hill, Quebec, Canada.

B. L. HAWKINS

1600 Brewster
Cincinnati, Ohio

• • •

[A. L. Rawlings brings up an interesting point on the subject of escapement error presented in the series of articles by Harold C. Kelly (A.H.&J. Oct., Nov., Dec. 1953) Following is his letter, and Mr. Kelly's reply.—Ed.]

The Editor:

May I congratulate you on the fine series of articles on *A Study of The Pendulum* by Mr. Harold C. Kelly just completed in your magazine?

The subject is a difficult one, but Mr. Kelly handles it with a light touch that makes it seem easy and he makes his points with clarity and an enviable brevity which I do not remember to have seen equalled.

The subject of Escapement Error is important because the design and performance of pendulum clocks depend on a proper understanding of it. At present I do not find myself in full agreement with Mr. Kelly's presentation of the theory, although, since his treatment follows the same lines as that of many other eminent horological writers, alive and dead, it is more likely that he is right than I. However, I venture to put my side of the case for the consideration of your readers.

On Page 15 of the November issue, the laws of the escapement error are printed in italics. Briefly: an impulse delivered to the pendulum *before* the dead point accelerates, but an impulse after the dead point retards. This is an experimental fact that it would be idle to deny. It is in the deduction drawn from these facts that the trouble seems to me to lie.

Mr. Kelly truly says that some escapements give impulse after the dead point and some before; and it follows that the former kind make the oscillation slower than it would be with no escapement, while the latter make it go faster. Now what I want to know is—What harm is there in that? In other words, I don't see the reason for Mr. Kelly's desire to have the impulse delivered just *at* the dead point so that the pendulum may swing with the same period as a free pendulum with no escapement.

In further explanation, let me suppose that Mr. Kelly makes a clock with a pendulum equivalent to 39.1 inches long so that it will swing in exactly 1 second with no escapement. Then let him fit it with an ideal escapement that only gives impulse at the dead center. If everything is according to specification, the clock will keep time from the moment it is put to work—*without any regulation.*

Next let me make two clocks, each with a pendulum identical with Mr. Kelly's. I will fit one of my clocks with an escapement that gives its impulse after dead center and the other with an escapement to give impulse before dead center. We might expect the first of my clocks to lose several seconds a day while the other would gain just as much; but Mr. Kelly's clock would neither gain nor lose.

There are several flaws in this story. First, neither Mr. Kelly nor I nor anyone else can make a pendulum by calculation to swing in exactly one second. The length of 39.1 inches is an imaginary quantity that has no measurable counterpart in a real clock pendulum.

Secondly, if the pendulum really were of

the true length given by the usual formula for a one-second pendulum, the clock would not keep true time. This formula is only correct for a pendulum making an infinitely small swing. If the swing were even 1½° either side of zero, the clock would lose 3.7 seconds a day; for 2° the loss would be 6 seconds a day.

So Mr. Kelly would have to put his clock together and run it to find what the circular error was for the particular arc; and then he would proceed to bring it to time by adjusting the final length of the pendulum by a rating nut just as I should have to do with my two clocks. Indeed if the escapements of all three clocks were boxed in out of sight we should not be able to tell by their behavior (after regulation) what sort of escapement any clock had. The advantage of Mr. Kelly's "ideal" escapement would be quite illusory.

Thirdly, the expectation mentioned above that the escapement errors of my two clocks would amount to several seconds a day is exaggerated. Lord Grimthrope in his 1850 edition of *Clock and Watch Making* calculated the escapement error of a good dead-beat escapement as 0.8 second losing. I have found that with a bad dead beat escapement giving all its impulse after the dead point, the error is 0.92 seconds a day. A recoil escapement however may cause about 3¼ seconds a day gaining.

But whatever error the escapement introduces will be compensated for by adjustment of the rating nut and in practice there would be nothing to choose between the three clocks described. Or would there? Let us pursue the story a little further.

Years pass. The oil in all three clocks dries up; dust settles on the works and the arc of swing of each diminishes from an original swing of 2° a side when the clocks were new to 1½° in each clock when it is old and dirty. The change of circular error alone due to this cause will be about 3 seconds a day. Mr. Kelly's clock having no escapement error will, therefore, go 3 seconds a day faster when dirty than when clean.

My two clocks will both suffer in the same way, but mine will also be affected by escapement errors which will be magnified as the arc falls off. One of them (the one whose impulse comes after dead center) will lose about ¼ second a day from the change in escapement error; the other will gain the same amount. These changes in escapement error must be added algebraically to the change of circular error to find the overall change of clock rate.

Thus while Mr. Kelly's clock will gain 3 seconds a day—

One of mine will gain only 2¾ seconds a day—

And the other will gain 3¼ seconds a day.

So in the long run, the best of the three is not the clock with no escapement error, but the one that has a losing escapement error because the impulse occurs after the dead point. This is the case with the Graham dead beat escapement the small error of which is thus seen to be a positive virtue, and not a defect as has been supposed hitherto.

Whether we are considering circular error or escapement error, the important question is not the absolute amount of that error but its variations with changing conditions. Because variations in circular error with amplitude of swing of the pendulum far outweigh all other causes of variable rate in pendulum clocks, there is nothing half so important as keeping the arc constant if a clock is to be a steady timekeeper.

A. L. RAWLINGS

178-50 Leslie Road
Springfield Gardens, N. Y.

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The Editor:

Dr. Rawlings has brought out a point well worth considering. His arguments appear logical and I am wondering if he will find the following defense of my paper logical also.

I shall not argue the point that the escapement error is a minor quantity in a precision clock but I question whether it is as small as stated in the wide variety of popular-priced domestic clocks. It should be noted that a seconds regulator has a long pendulum and a bob that weighs several pounds, whereas the domestic mantel clock has a short pendulum and the bob weighs only several ounces. This, it seems to me, leaves no doubt which clock would have the greater escapement error. Does not the law of inertia play a part?

In my experience I have found spring-powered eight-day clocks that would run on time for six or seven days and then lose as much as five minutes by the end of the eighth day. It may be argued that the escape wheel teeth and pallets are worn to show such an extreme loss but even so, would not the changed rate be considered an escapement error? And further, would not the same clock lose less time if the escapement could be designed to give impulse nearer to the dead point?

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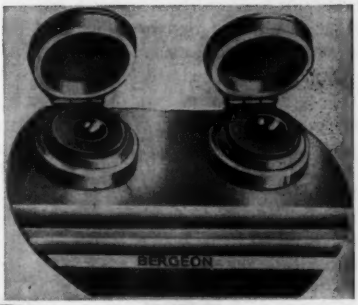

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THE WATCH REPAIRMAN AND THE OSCILLOSCOPE

By Carl H. Anderson

The Cause of Oil Failure in Watches

DROP into almost any jewelry store or watch repair shop in America today, walk up to the watchmaker and start a conversation with him by stating that you, too, make your living at the watch bench. We will give you any reasonable odds you want to mention, that in less than three minutes the conversation will turn to the failure of the oil in watches. We believe there is more interest today in watch oil failure than there is in any other one thing in horology. Please note that we did not say clock oil because oil failure there is almost unheard of.

We sincerely doubt if there is a watch repairman in America today who has not had oil trouble. The oil dried up, thickened, turned to jelly, formed a hard mass that had to be cut off the jewel with a sharp knife or a razor blade, disappeared leaving only an iridescent film, turned to a pile of dust resembling powdered rouge, evaporated completely leaving no trace at all as though it had never been oiled, or something else happened to it.

Let us unequivocally state that we are not chemists, nor are we oil specialists, but we do believe we have found the major cause of all this oil failure as well as a few of the minor causes. We fully believe that after you have read this article, you, too, will concur in our findings. We do not positively state that we have the answer to the problem for every watch repairman, but we do know what it has meant in our own case, as well as a few thousand others to whom we have communicated our findings during the past ten years. This isn't something that has been hurriedly gotten together to make an interesting article to read, but is based on thousands of actual cases, by many watch repairmen throughout the entire United States.

Right in the very beginning, we are going to make the flat statement that the oil was not at fault, almost regardless of what make of oil you were using, although if you used an oil of too light a viscosity, you had more trouble than those who used oils of medium or heavy viscosity. The oil you used was O. K., else why did some watches run O. K., while others gave plenty of trouble as comebacks and they were all oiled from the same bottle of oil. *Ever think about that?* We fully realize that there will be plenty of skeptics who will have to have it all proven to them before they give in that it was not the oil that caused all the trouble.

By far the vast majority of your trouble was caused by the tin can in which your watch rinse solution was shipped to you.

Notice we did not say the watch cleaning solution, although it, too, was shipped in a similar tin can. If your rinse solution was doing its job correctly and as it should, it would remove anything that the cleaning solution could have contained that would cause trouble.

Take a good look at one of the tin cans in which your watch rinse solution was shipped to you. Examine it very carefully. Notice that the top and bottom are fastened to the side of the can by a rolled seam, no soft solder being used. Now look at the seam up the side of the can. It is soft-soldered, is it not? Since soft solder was used, it was necessary to use some kind of a flux to make the soft solder stick to the tin when the hot soldering iron was applied.

Did you ever hear of a tin can manufacturer using rosin for flux when soft soldering a tin can? We never did. Every tin can manufacturer of whom we have

Mr. Anderson will be glad to answer any question pertaining to the Oscilloscope. Queries should be sent to him in care of the American Horologist & Jeweler, with a stamped return envelope enclosed.

any knowledge who makes a soldered can uses an acid flux. No doubt you have made soft solder flux yourself by dissolving zinc in muriatic acid. Notice your watch rinse solution tin can is not lacquered on the inside as are tin cans used for canning foods, fruits, juices, vegetables and so on. If they were lacquered, we seriously doubt that you would ever have had any oil failures.

Do you think a tin can manufacturer uses anything to remove the excess of flux after the can seam is soldered? We never heard of it; that would add additional cost to the manufacturing process. Even if he did, do you think it possible to remove all the flux from the fold of the seam or deep down inside the joint? Yes, we believe it possible, but not probable. So in every can there is left in the seam a small quantity of the soldering flux.

Do you think this flux will affect watch oil? If you doubt it, put just a little of any flux on an old pinion, wheel, jewel or other watch part. Heat it like a soldering iron would until the flux apparently disappears or loses its fluidity. Then put a small droplet of the watch oil you are using on top of the dried-up flux. Put it away for a few days, then examine it to see what has taken place. This is a very interesting experiment and well worth your trying. If you do this, it may completely change your ideas about oil failure.

You may say that the hot soldering iron burnt out all of the flux when the can was soldered, but did it? Sure, it dried up the flux, but try it yourself and you will see the flux left a film on whatever you used for your experiment. Put a droplet of oil on the dried-up flux and then look at it a few days later.

There are many fluxes used for soft soldering. A very good one is to dissolve chloride of zinc in alcohol. (Both obtainable from your local druggist.) It works beautifully in soft soldering jewelry. If handled correctly, your soldered place will look as though the solder had been highly polished, then silver plated. Then there are two other popular soft solder fluxes, rosin for one, and the other the zinc dissolved in muriatic acid as before mentioned. Let us ask you as a fair-minded person, if you would put any one of these or any other soft solder flux on a highly polished

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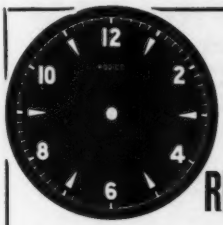

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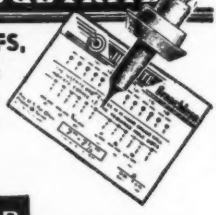

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pinion, wheel or pivot of a watch. *Of course you would not.* But—can you prove you are not doing this very thing every time you use a watch rinse solution that was shipped to you in a tin can? *We very definitely say you are doing this very thing.*

Have you ever seen the formula of any watch rinse solution published anywhere in any horological journal? We doubt it; we haven't. We have the formula for many of the cleaning solutions and have seen most of them published many times in almost every horological journal, but nary a one of a watch rinse solution.

The watch rinse solution we use and have used successfully for about ten years is composed of approximately one-half benzol and one-half carbon tetrachloride. The proportions are not critical and do not have to be exact. We have found this to be entirely satisfactory and in all these years have not had a single oil failure when we used this mixture. Benzol is highly inflammable and must be handled with caution. Lay your cigarette aside when pouring out benzol. A spark might cause a fire in your cleaning machine. The carbon tetrachloride is one of the best fire extinguishers known and is the cleaning agent used in all odorless dry cleaning. It is a wonderful solvent for all oils, gums, waxes and greases. It readily dissolves montan, ceresin and carnauba waxes, and if you have ever tried to dissolve or soften any of these extremely hard waxes, you well remember the trouble you had.

By mixing the benzol and carbon tetrachloride your watch rinse solution will be practically fireproof. Pour out a few drops of the mixture on the top of your bench. Light your cigarette lighter or a match and hold it over the solution where you poured it on your bench. *The liquid positively will not ignite or burn,* but the gas given off by the benzol during evaporation will ignite. Likewise, the gas given off by the carbon tetrachloride during evaporation will extinguish the flame of the benzol gas. You will have a little "poof" which goes out immediately, therefore there will be no sustained flame or fire. The fumes or gas from benzol and carbon tetrachloride are toxic, so do not breathe too much of either of them or the mixture. Keep your

solution jars covered at all times except when moving your watch cleaning machine basket from one jar to the other.

As we understand it, practically all of the watch rinse solutions on the market today are actually compounded by one of the major oil companies. Some of them are putting out a watch rinse solution which is 60 per cent benzene and 40 per cent carbon tetrachloride. But—here is the catch: Every one of the major oil companies *add an inhibitor to their watch rinse solutions.* Why is this done? The answer is, they know the watch rinse solution is going to be repacked into one quart and one gallon tin cans when it is sold to the watch repairman. They also know a soft soldered tin can is used in the repacking. They likewise know some of the soft solder flux may be left inside the can, hence the *inhibitor.*

What is this *inhibitor?* It is a chemical which is supposed to neutralize or counteract the action of any soft solder flux left in the seam of the can. In the majority of cans, the inhibitor does its work satisfactorily. But ever so often an excess of flux is accidentally left in the can and the quantity of inhibitor regularly included in the rinse solution is not sufficient to completely neutralize such an excess of the flux. What happens? You literally give your watch a bath in soft solder flux. Now, we ask you, *is that good?* We definitely say, *No! No! No!!* In cans where the flux is completely neutralized, you do not have any oil trouble or failure, thus no come-backs from that particular can.

Did you ever notice in using the same make watch rinse solution for years that you go along for quite a while with not a single come-back from oil trouble? Then, *bingo!* All of a sudden you get a whole string of come-backs with oil failure. When this happens, if you will check your watch repair register, you will find your come-backs all started at a certain time and continued consecutively, without missing a single one, for some time. What happened was this—your very first come-back started when you commenced using a new can of watch rinse solution. If you had made a notation on your watch repair register of the very first watch on which you used this particular can of watch rinse solution you would

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have found that practically every watch on which this particular can of watch rinse solution was used was a come-back as a result of oil failure.

On the other hand, the very next can of the same make watch rinse solution might be O. K., with not even a single oil failure come-back. All through this you used the same bottle of oil; don't forget or overlook that fact. Now then, *if the oil was to blame, why didn't they all come back when they were all oiled with the same oil from the same bottle?* Why were all your come-backs all from the same can of watch rinse solution? Use just a little commonsense or logic and you will be able to arrive at the correct answer yourself.

You may go along for 10, 20 or 50 or more cans of the same make of watch rinse solution and not have a single oil failure come-back. Then you start using out of a new can of watch rinse solution and they all come back. If you doubt any of this, here is a simple way you can prove it in your own work at your own bench. Each time you open a new can of watch rinse solution and begin using it, make a notation in your watch repair register of the first watch on which that can of rinse solution was used. Continue doing this every time you start using a new can of watch rinse solution. Then when the come-backs start coming in from oil failure, go back and make a notation of the come-backs on your watch repair register book. Continue doing this on every oil failure come-back and notice the come-backs are all from the same can of watch rinse solution. Of course you might get 2, 3, 4 or even more bad cans of watch rinse solution right in a row, but all of a sudden you will get some cans from which you will have no come-backs. *Do not change brands of oil.* Continue using the same bottle of oil until it is all used up. This all sounds logical, does it not? Try it out for yourself and prove it to your own satisfaction.

• • •

We have had the pleasure of working in a city where one of the major oil companies have one of their largest refineries. The store had been using a standard, nationally sold brand of watch rinse solution prior to our employment there. Shortly

after we went to work there, we had a come-back of a watch which belonged to one of this oil company's top research engineers. He insisted on knowing what was wrong with his watch as it was an exceptionally fine one and one of our other watchmakers had cleaned it not three months before. We frankly told him the oil had failed, not at that time knowing who or what he was. He immediately replied that he could not see how that was possible as he was the chief research engineer at the local refinery and resented our blaming the oil. We then showed him some of the cap jewels where the oil had dried up, leaving an iridescent film.

He readily admitted something had happened to the oil and said it positively could not have been the fault of the oil. He further said that we were using something or doing something in our watch cleaning process that was killing the oil. To this we very readily agreed, but told him we did not know positively what it was. We talked on for a few minutes, showing him a watch in the process of being cleaned in the cleaning machine, explained the cleaning and rinse solutions that we had been using prior to my employment there. We told him we would be glad to re-clean his watch free of charge, then he said, "How do you know the same thing won't happen again?" There he had us and we told him we could not be positive that it would not happen again. He said that if we used the same process and the same solutions we had used the first time, he was certain the same thing would happen again. He asked how we bought our solutions and from whom. So we just put the cans up on the counter. Immediately upon seeing the tin cans, he said, "I think I know where your trouble is."

We told him he would have our everlasting undying gratitude if he would give us the answer as up to that time we had had over 400 come-backs in a few months. He immediately asked, "Why don't you buy your solutions in glass jugs?" We told him we could get a cleaning solution in glass jugs, but all watch rinse solutions of which we had any knowledge were shipped in either one quart or one gallon tin cans. (And, by the way, buying your rinse solution in one quart tin cans, gives you just four times the chance of having oil fail-

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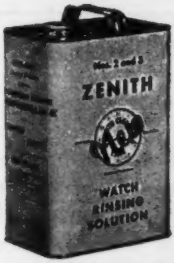

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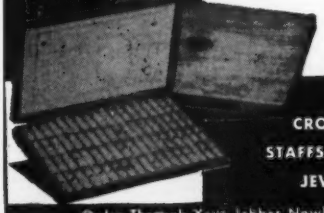

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ures that buying in one gallon cans would because you would have four soft soldered seams in the four one quart cans compared to only one soft soldered seam in a one gallon can.)

He continued by saying he believed we were using a rinse solution of their own manufacture, but with someone else's label on the can. He copied down the name from the label and said he was going to check with their sales department to make sure as he was not in that department and did not know all of the companies to whom they sold their watch rinse solutions. He then said he would personally bring us a five gallon glass carboy of their watch rinse solution without any inhibitor in it for us to use. He asked that we use this on his own watch when we recleaned it. We used that five gallons and did not have one single come-back from oil failure at the end of two years after the watches were cleaned with it. When we questioned him he readily admitted that it was 60 per cent benzene and 40 per cent carbon tetrachloride and that was all there was in it. He further stated he would drop in at least once a month for us to check his watch on the oscilloscope as we had shown him and explained how the oscilloscope found oil failure. We also showed and explained the oscilloscope trace of a freshly cleaned and oiled watch. He said they had six oscilloscopes in their laboratory and was acquainted with many of the things an oscilloscope would do, but that he had not seen an oscilloscope used before on a watch.

He explained how and why the inhibitor was put into the watch rinse solutions. He also said he understood what would take place chemically if any of the soft solder flux used in soldering the tin can should come into contact with the oil. We found him to be very co-operative and he invited us to come down to his laboratory with some watches on which we could perform some experiments. Naturally we welcomed this suggestion and took him up on his offer. During the next year we made many trips to the laboratory and although we are not chemists, we learned a great deal about oil and watch rinse solutions. Insofar as we are

concerned, he completely proved to us that it is the tin can which causes all our oil failures. He also explained the effect of heavy humidity in the room when a watch is being cleaned, reassembled and oiled, but that will have to be covered in another article. Just make sure that the room in which you work on your watches does not go above 60 per cent humidity. However, the lower the humidity, the better for your watches, but not so good for you.

Now to take a commonsense view of oil failures and use a little plain, common every-day logic and "horse sense." If you worked many years at the bench before the advent of the watch cleaning machine, you know full well that oil failures were unheard of at that time. Back around the turn of the century, it was nothing for a customer to bring in a watch for cleaning that had been out for four or five years. When the watch was torn down, the oil was found to be still good and in a fluid state. *Why?* Because we did not use rinse solutions in those days. If you have been at the bench long enough you know this is true. You likewise know that it is only since the cleaning machine came into general use that we have had oil failures. Throughout all of this time there has been nothing at all wrong with any of the oils that watchmakers used.

We do not say, nor do we believe there is anything wrong with the watch cleaning machine. We own two of them and one or the other of them is in use every day on every watch we work on. We sincerely believe that machine cleaning is much better, does a better job much more thoroughly and of course much faster than hand cleaning. Under no circumstances would we go back to the old days of hand cleaning when we strung all the parts on a wire, scrubbed them in white gasoline (ethyl gasoline wasn't known in those days, neither were high test, high octane or anti-knock gasolines), took them to the back room, dipped them in a solution of potassium cyanide (it was cheap in those days and we didn't use sodium cyanide at that time), rinsed them, scrubbed them with a wash-out brush using a hard water castile soap worked up into a thick lather, rinsed in running water, then into alcohol, then hot sawdust, then a second cup of alcohol and a second box of hot sawdust.

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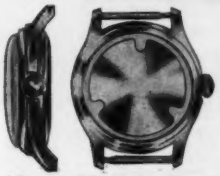

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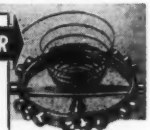

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You oldtimers will remember those days. My, how much time we wasted in picking out tiny bits of sawdust from small pinion leaves that the elder pith failed to remove.

Yes, we did a good, thorough job of cleaning in those days, pegged every hole. Put the balance in a little aluminum balance wheel holder and fiddle bow polished the side of the rim and the screws, then laid the balance wheel on the bench block and polished the top of the rim with a buckskin buff and rouge, then washed it off again in white gasoline. "Them were the happy days." And we did all that work for a dollar and liked it. "Them days are gone forever for most of us, Pappy," although we know a few watch repairmen who are still using this old method.

Now what is it about the rinse solution that causes our present-day oil failures? The best answer we have found to this question is that the flux that has been neutralized by the inhibitor leaves a microscopic, invisible film on the surfaces of the jewels and inside the jewel holes. We also know that those watch repairmen who very carefully peg out all jewel holes and likewise wipe off both the upper and lower surfaces of the jewel and oil sink in the jewel hole with either peg wood or the small leather wipers (these are sold under the trade names of "Suabs" or "Jewel Brights") that they do not have nearly so many come-backs from oil failure as those who do not follow this routine. The watch cleaning machine enthusiast will tell you that all this pegging is not necessary because the solutions in the cleaning machine go all over and through the watch, through all holes, etc. Of course this is true partly, but the film from the neutralized soldering flux is there unless all jewels are very carefully, thoroughly and completely cleaned, which means *pegging and wiping.*

Is this oil failure a problem that is peculiar to only the United States? *No! Definitely it is not!* It exists everywhere throughout the entire world wherever watch cleaning machines are used with rinse solutions taken from tin cans. We are regular subscribers to many of the horological trade magazines, such as the "British Horological Journal," "Journal Suisse d'Horlo-

gerie et de Bijouterie," "La Suisse Horlogerie," "Revue Francaise des Bijouteriers et Horlogers" and a few other foreign horological journals. Almost every month these journals contain letters from their subscribers *from all parts of the world* asking for information about oil failures and what to do to overcome them. Without exception, every one of them is using a watch cleaning machine with rinse solutions that were shipped in tin cans.

Right here in the United States we have personal knowledge of over 400 watch repairmen who have discontinued use of their watch cleaning machines and gone back to old-time hand cleaning in the false belief there was something wrong in the cleaning machine process that was causing all their oil failures. Something like over 100 of them tried using the same rinse solutions in hand cleaning that they had used in their watch cleaning machines and found they had the same oil failures. The other 300-odd went back to the old-time method of white gasoline, cyanide, soap suds, alcohol and sawdust, pegging and cleaning all jewels thoroughly. These 300-odd *report no oil failure come-backs.*

• • •

A couple of years ago we had a very disastrous experience. We own a very fine Swiss watch with a Rating Bureau Bulletin. During the noon hour while we were out of the shop, one of the other boys was changing solutions in his cleaning machine. Having heard us say that morning that it was time for us to change our solutions, he changed ours without our knowing it. He had less than half a gallon of a well-known brand of rinse solution and since he wanted to use it up, he put it in both his and our machines. Had we known this, we would not have used it, as we had been using the half-and-half mixture of benzol and carbon tetrachloride. That afternoon we cleaned our own watch. Two days later it stopped, so naturally we examined it. The afternoon we cleaned our own watch we also cleaned another fine Swiss watch belonging to a customer. Two days later it stopped also. The next day after the solutions were changed, we cleaned five other watches using this rinse solution. In all, seven watches went through this rinse solution before our own watch stopped. What happened?

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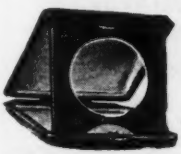

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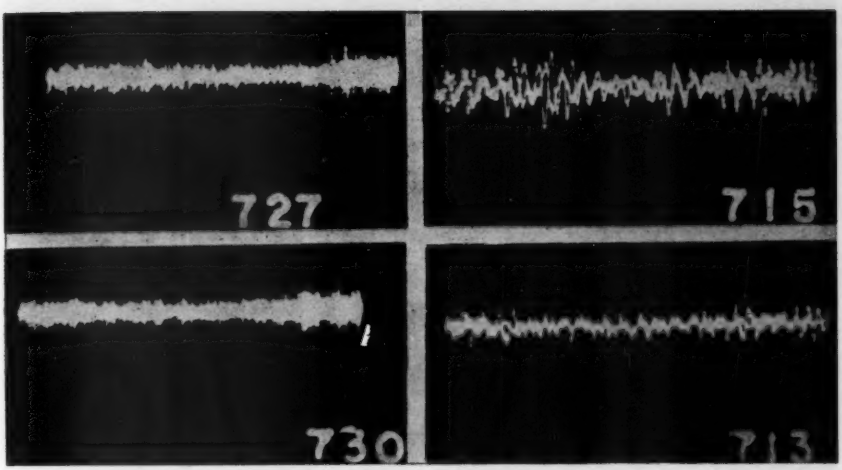
THE OSCILLOSCOPE—Continued

Upon examination we found our own watch to be almost a solid mass of rust, completely ruined, beyond all economical repair. That afternoon the customer's fine Swiss watch also stopped and it was in the same condition. Result—We bought a new watch and our employer either gave the other customers new movements or we completely rebuilt the other six replacing all ruined parts. It proved to be quite an expensive rinse solution.

● ● ●

Right now, jewelers and watch repairmen all over the country are having a barrel of grief with new watches. Many of them are actually oil failures, but there are some in particular where it is more than oil failure. There is one specific case where the watches are all coming through with unsually rough holes in the jewels. These watches are giving all manner of trouble and the manufacturers have even discontinued certain models and brought out new ones, but they are no better than the discontinued ones. You will find that not only will you have some of these watches in which there is oil failure, but that you will have to put in new balance hole jewels to get the watch to even run. We have had these watches come in for repair where they had bent the lever up, down, to the right, to the left, reset the pallet stones in all manner of fashion, bent or replaced the guard pin, and practically every other thing that you can think of that could be done to an escapement and still they were "stoppers."

Evidently they were brought to us because someone else had failed to make them run satisfactorily. All we did to them was to put the escapement back into its original condition and straighten out the lever, if it had been tampered with. Then we took out both the upper and lowerer balance hole jewels, selected good Swiss jewels that fit properly, pressed them in, oiled them, put the cap jewels back on, wound and set the watch, checked them on the oscilloscope and we haven't had a single one of them come back except to be cleaned later on or something of that kind. This condition of rough holes in jewels extends through this entire line of watches from their smallest ladies' movements to their best railroad grades. If you have



Oscillograms indicating rough hole jewels

trouble with them, fit new balance hole jewels and it will cure 98% of them. On the other 2% you will also have to fit new hole jewels to both ends of the pallet arbor and the escape pinion. This is particularly true in their current production of their smallest ladies' movements.

To understand what a rough hole jewel looks like on the oscilloscope screen, we present oscillograms No. 727, No. 715, No. 730 and No. 713. In order that you may understand how these oscillograms were made, we will explain. First, we completely disassembled the movement. Then we put back in the complete balance assembly and the cock plate. By having only the balance in the watch we would get only the sounds of the balance pivots oscillating in the jewel holes. We placed the movement in a clip and put it under the microphone on the timing machine. Wet then took a blower, blew on the balance and set it in motion. Of course with only the balance with the hairspring and roller table attached, you would pick up only the sounds of the pivots in their jewels. Quite naturally a rough hole in a jewel or a rough pivot or bearing will produce a scratchy sound when a pivot or

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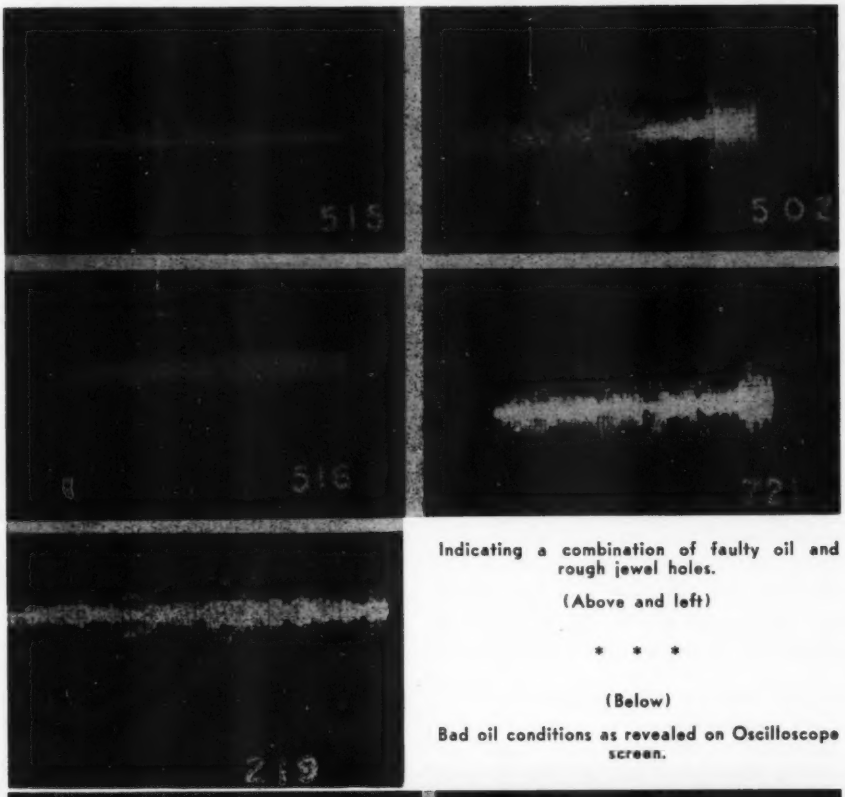


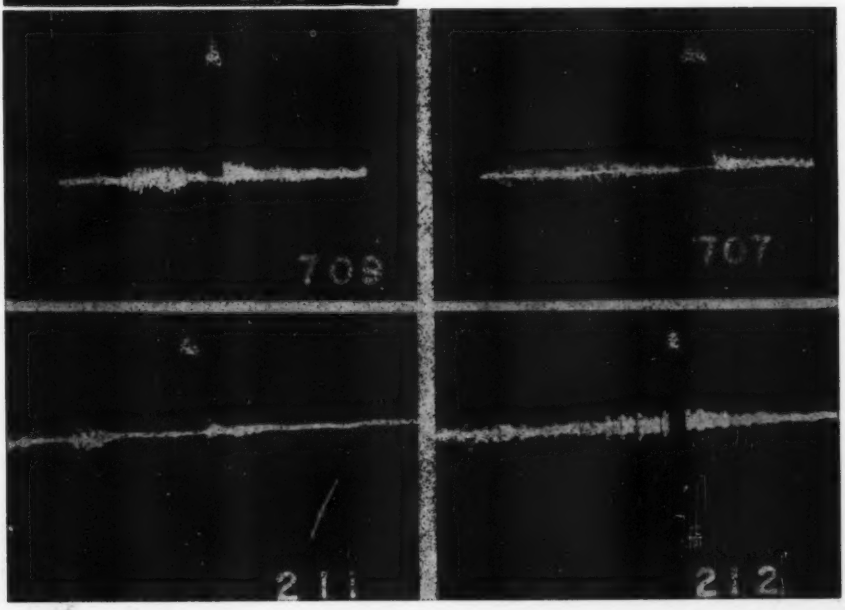
Indicating a combination of faulty oil and rough jewel holes.

(Above and left)

* * *

(Below)

Bad oil conditions as revealed on Oscilloscope screen.



shaft is rotated or oscillated in such a jewel or bearing. You will notice neither of these four oscillograms show any particular pattern, only a series of up-and-down scratchy lines or pips.

If you have any doubts about a jewel having a rough hole, simply disassemble the movement and leave in only the part where you suspect rough holes. If you turn up your volume control to full-on you can hear the scratchy sound in your headphones, provided the jewels are bad. On the oscilloscope, however, you will be able to see the scratching from the rough jewels that you will not be able to hear in the headphones due to the low level of the sounds.

We have already published many oscillograms showing bad oil conditions, but what about combining faulty oil with rough jewel holes? Examine No. 515, No. 502, No. 516, No. 721 and No. 219 and you will see what happens. In each one of these you can distinguish part of the watch tick, but most of the tick is covered up by the louder sound of the scratchy jewel holes. Whenever you encounter both of these conditions in the same watch you can depend upon it that your customer is thoroughly disgusted with his watch.

Now look at No. 709, No. 707, No. 211 and No. 212 and you will find some really bad oil conditions.

In No. 709 and No. 707 it was found upon inspection that the oil had thickened until it was almost like jelly. In No. 212 the oil had hardened until it had to be cut off the surfaces of the jewel with a razor blade. In No. 211 the oil had turned to a pile of red dust, looking like powdered rouge.

Then if you want to see some really "screwy" watches, see what you think of No. 712, No. 714 and No. 722. We won't go into detail about them at this time, but these watches were in really bad condition. One thing you must understand about any oscillogram and that is, that the watch must produce some sound wave, no matter how feeble the tick may be. You can not get a trace on the oscilloscope screen from a watch that refuses even to tick. So you must understand that all of our oscillograms had to be made from a ticking watch, no matter how bad or how feeble the tick was and no matter how bad the oscillogram might be.

Then there is another thing about faulty oil. Look at No. 1311 and No. 1331. Notice that it takes the escapement approximately 33 milliseconds to complete its action from the time the roller jewel first strikes the fork slot at entry until the escapement is completely stopped at full lock. As a general rule, any escapement action time that exceeds about 18 to 20 milliseconds at the outside is not in good condition. No. 1311 and No. 1331 were made from a very high-grade American-made 23 jewel, 16 size railroad grade watch. No. 1311 is in the dial down position, with a sweep rate of 20 per second. No. 1331 is in the pendant up position,

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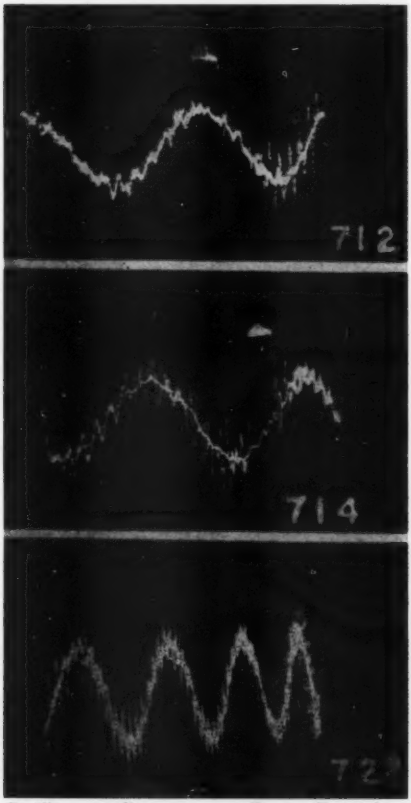
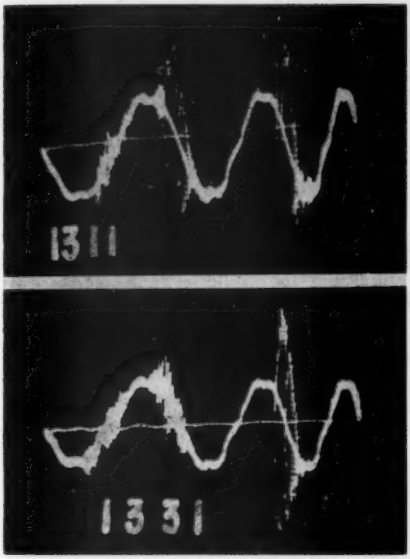
From what we have told you before about the unlocking action, the coming together of the impulse faces of the escape wheel tooth and the pallet stone, the lever striking the banking pin the first time, the rebound of the lever from the banking pin until it is stopped by the guard pin striking the safety roller, safety lock, draw and total lock, you can readily determine that this watch could not possibly keep good time and that the total balance arc was only about 270°, far too little an amount for balance arc. We will shortly publish a complete set of oscillograms and timing machine charts of this watch both before and after cleaning and adjusting.

By now you may be thinking, this department is supposed to be devoted to



Oscilloscope discovers some "screwy" watches.



Oscillograms above show evidence of faulty oil slowing down escapement action.

Horological Oscillography, and what has oil failure, rough holes in jewels, etc., to do with this subject? The answer is obvious. Only the oscilloscope will tell you the exact oil condition, rough holes in jewels, and so on. As a jeweler you are selling new watches, and as a watch repairman your employer expects you to make these new watches run, keep time and satisfy the customer. Is there anything more exasperating than to sell a customer a new watch and have them bring it back the first thing next morning, *stopped?* We know you have had this happen many times. Wouldn't you like to stop this trouble? That is a foolish question, isn't it? Would you like to know when you deliver a new watch to the purchaser whether or not it is going to run, keep good time and satisfy the wearer? You can know all these things and many more too, if you examine every watch you sell with an oscilloscope before delivering it to the customer.

What do you tell a customer when he brings back a just-sold new watch that is stopped or isn't keeping correct time? Do you tell him the oil has dried up and you will have to clean the watch? If you do, you are inviting plenty of trouble. Does your watchmaker try to "goose" it up?

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THE OSCILLOSCOPE—Continued

That only makes more trouble later on. Does your watchmaker take out the lever and run it down a few times, then add new oil to the old oil? If you do that, why do you change the oil in your automobile engine? Why don't you just add a quart or so every 5,000 or 10,000 miles? You know it won't work in your automobile engine, so why do you think it might work in a watch? Quit kidding yourself and the customer. Oil is oil, isn't it? Doesn't matter whether it is in an automobile or a watch, does it? True, each uses different kinds and grades of oil because they are each doing a different work, *but* aren't they both used to *properly lubricate?*

In the store where we are employed, every time a shipment of new watches is received, they are carefully checked both with the timing machine and the oscilloscope before they are checked off the invoice or price tags affixed. Those that are found to be faulty are immediately returned to whomever we purchased them from. Sure, the wholesalers, importers and manufacturers do not like it, but why should our employer pay us to do over watches that should have been in good condition when he purchased them? We also check every watch on the timing machine and the oscilloscope when the customer buys it and we let the customer see us do it.

There is another line of watches that have pallet arbors which are "out of upright." This condition exists in both their ladies' and gent's watches. We have "uprighted" many of them, but we usually return them to the factory for correction, which they do free of charge. There is still another line of watches in which the lower balance jewel is frictioned in too deep so that the oil sink of the lower balance hole jewel just barely rubs the cone of the balance staff pivot in the dial down position after it has been out for a while. This usually causes the watch to be a "stopper" when the oil begins to thicken or the mainspring begins to set. These are things that are all very easily seen and determined in the trace on the oscilloscope screen. We could go ahead with many other mechanical faults which are encountered in present day new watches but space does not permit.

We have felt for years that since watches are received by the jeweler with these constructional faults that some of the horological journals should point out these things to the man at the bench, giving the name, model, calibre, and all other information so that the watch in question can be easily identified when one comes to your work bench. For some reason or other this has never been done to our knowledge. If it were done it might make some manufacturers, wholesalers and importers more careful of what they ship out to the trade as they would not want their name in print for every jeweler and watchmaker to read. Perhaps the whole subject is "strictly taboo" or "hush-hush" and we should not have mentioned it, but it is these very things that give the man at the bench his headaches. The oscillo-

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scope will find these faults for you, but *you* still have to rectify them.

For example, if you knew definitely that the little lady's watch you have been having trouble with does have a pallet arbor so far "out of upright" that the escape wheel tooth strikes the receiving pallet stone almost at the top of the locking and impulse faces and the tooth strikes the discharge pallet stone almost at the bottom of the pallet stone, would you try to bend the lever, bend the guard pin, reset the pallet stones or in any other manner butcher or mutiliate the watch, or would you return it to the maker? This condition is very easy to determine. The plates are cut away around the escape wheel. Remove the balance and cock plate. Hold the movement horizontal, dial down, in your left hand with the escape wheel side toward you. With your loupe look directly over the top of the escape wheel and under the pallet bridge. Look first at the receiving pallet stone, then at the discharge pallet stone. Try to determine if the escape wheel teeth are striking both of the pallet stones at the same level. In this particular watch you will see the condition instantly. Then turn the watch slightly, rotating it until the pallet arbor is almost hidden from sight by the escape wheel pinion and you can see the pallet arbor is leaning quite a bit toward your left hand, or the receiving side if you prefer it said that way.

To upright the pallet arbor isn't a hard job and can be done in a few minutes by any fairly good watch repairman who has a face plate and a slide rest. Don't attempt to do this job with a friction jeweling tool only, as the hole in the pallet bridge is already out of upright and reaming it with the friction jeweling tool reamer will only enlarge the hole and not bring it back into line. You merely enlarge the hole and it still is over to one side, or "out of upright." "Uprighting" is an operation that most newer watchmakers have not been taught, so we won't attempt to go into detail about it here. If you want to know how it is done and have the necessary equipment with which to do the job, drop me a line enclosing a self-addressed stamped envelope and I'll tell you. When you run into one of these "out of upright" pallet arbors you will find there is a very great difference in the impulse given to the two pallet stones. It is readily seen in the oscilloscope trace, and since you see it instantly, you see there is a big difference in the impulse between the tick and tock, you know immediately to look into the impulse action for some fault. What we are trying to do in these articles is to tell you about watch faults which are readily located with an oscilloscope that are quite difficult to find otherwise and are often overlooked.

The cone of a pivot rubbing the oil sink of a jewel produces an oscilloscope trace much like that of a pivot in a rough jewel hole, because both are a rubbing action. The rough jewel hole will usually produce pips of greater vertical height than the cone rubbing the oil sink. We could go on and on with these things but space does not permit, so we will bring some of them into as many of our future articles as we possibly can. Be on the lookout for them.

To get back to the elimination of oil failure, use any good oil, *but*—refuse to accept any watch rinse solution that is delivered to you in a tin can with a soft soldered seam. Manufacturers can package

their rinse solutions in glass jugs just as easily as they can in a tin can. It wouldn't do any good for you to empty the rinse solution in a glass jug when you receive it, as the damage has already been done long before you receive it. By using a glass jug, the oil refineries would be able to leave out the inhibitor. On the other hand, if you wish to try making your own rinse solution, then we suggest your trying half-and-half benzol and carbon tetrachloride, but make sure that neither of these chemicals have ever been in a soft soldered tin can before you bought it. Use any good watch cleaning solution. We use the foaming type, and don't run our cleaning machines too fast; this avoids breaking small pivots such as those of the pallet arbor and keeps the solution from forming a thick lather on top.

We run our watches about five minutes in each solution. When we put the basket in the last rinse solution, we turn on the heater in the drier and let it preheat during the time the watch is running in the last rinse solution. By the time it is through the last rinse solution, the drying chamber is quite hot. We run the watch in the drying chamber about one minute with the heater on, then the heater is turned off, and the watch continues to run in the drying chamber with the heater off for about two or three minutes. The watches come out with the plates bright and shiny, the steel parts have a beautiful sheen. All the steel parts are "chemically dry" which means that the setting parts are practically "frozen," so they must be oiled rather liberally, especially the square on the stem where the clutch slides up and down, the rubbing surface where the detent pushes the clutch lever down, the clutch lever bearing in the pillar plate and the ratchet teeth on both the winding pinion and the clutch. This is to make them back ratchet easily. We oil these parts rather liberally with a very popular make bracelet watch oil, which is well known for its spreading properties as it spreads very rapidly.

We use a synthetic oil on all pivots, using a fountain oiler which we make ourselves from a glass tube similar to the tube of a thermometer. We apply the oil directly in the hole in the jewel from the flat or bearing side of the train jewels, and the oval side of the balance jewels where the cap jewels cover these jewels, then screw the cap jewels into place after we have placed a good drop of oil on the flat surface of the cap jewels. By oiling in this manner you will see a good bubble of oil between the back side of the balance hole jewel and the cap jewel. Incidentally, you must always have this bubble of oil and it should cover at least half the diameter of the cap jewel. This particular oil is well known for its non-spreading properties and it has a very high contact and surface tension property. It really stays put in place, right where you put it, so wherever you want this oil, be sure to put it there, as it will not spread to get somewhere else.

We do not recommend any particular make of oil, as we have eight different makes of oil in our bench at the present time. Some of them we have in as many as eight different viscosities of same make of oil. Some oils come only in one viscosity and are recommended by their makers for both bracelet and pocket watches. We will tell you more about that later on, as we are going to publish oscillograms of the same watch using eight different oils.

* * *

The perfect employe in a jewelry store is the fellow who has an open mind—and a closed mouth to go with it!

"I sent ten bucks for a course called 'How to Fix Your Watch.' And they sent a slip of paper saying, 'Take it to a watch repair shop'."

Jewelry Repairing

By R. ALLEN HARDY

Introduction:

IT HAS been my experience to read books, attend lectures and watch demonstrations intended to teach one how to successfully repair jewelry. I would not wish to criticize any of the methods presented for all of them were helpful, instructive and very informative. Yet it has often occurred to me that most lecturers, writers and demonstrators (including myself) make a common error—that of assuming the reader, listener or observer is well informed enough to understand each term used and absorb what is shown.

As a matter of fact, I remember when I understood few jewelry terms and had little knowledge of repair procedures. Yet the fact that I wanted to learn the trade seemed to convey the impression to others that I must already know something about it, so it would hardly be necessary to stress the obvious factors that beginners should have presented to them. This is precisely the point I wish to bring out—why assume a beginner knows anything whatever about jewelry work? Precious knowledge, not imparted to a beginner, can make many simple operations appear strenuous and difficult. I have seen students "sweat" out certain jobs for a great length of time simply because an "obvious" point was not mentioned.

With this in mind, subjects in this department will be presented in a manner assuming that the reader is a beginner who knows nothing whatever about jewelry work.

Soldering

In the jewelry trade and other trades, there are many different terms used to describe the action of joining together two pieces of metal. These terms might easily confuse the beginner in jewelry repair. Welding, brazing, sweating, etc., are in deed applicable to special types of work but are not nearly so applicable to the general run of jewelry work as the simple term of "soldering."

R. Allen Hardy, who will conduct a jewelry repair department for the American Horologist & Jeweler, is a certified watchmaker, engraver, jewelry repairman and stone setter. He is a trade journal writer, and a former instructor in watchmaking, engraving and jewelry repair at the Bowman Technical School. He is currently a material distributor in Jacksonville, Florida, and is in daily contact with watchmakers and jewelry repairmen. He knows that knowledge of the simple fundamentals of jewelry repair are badly needed by the average watchmaker, and intends to teach practical work beginning with basic training. Mr. Hardy invites comments from his readers.

For the average jeweler, all soldering may be divided into two classes—soft and hard soldering. The difference is great and the technique employed is decidedly different. Soft soldering may be described in a paragraph, while the technique of hard soldering may be discussed indefinitely.

Soft soldering is so called because the metal used to join two other pieces of metal together, forming a soldered joint, is a "soft" metal like lead or bismuth. These metals have a very low melting point, requiring only an alcohol flame to melt them.

Hard soldering is so called because the metal used to join together two other pieces of metal, forming a soldered joint, is (as compared to soft soldering) a "hard" metal such as gold, silver, etc. The melting point of the solder used for hard soldering is, of course, somewhat lower than the metals being joined together, but still requires great heat (as that generated by a gas flame or electric arc).

In both soft and hard soldering a chemical solution called a "flux" is applied to prevent oxidation at the surfaces to be

soldered. With the aid of flux the solder flows where flux has been applied.

A quick word about fluxes. The flux used for soft soldering is useless for hard soldering, and vice versa. This may seem hardly worth comment and fairly obvious, but it has been my experience to observe several attempts to use one flux for both types of soldering and it hasn't worked yet.

It is hardly necessary, today, that the beginner in jewelry repair know what ingredients are used in making up a soft or hard soldering flux. There are fluxes on the market at present that are superior to anything ever before offered to the jeweler. With little knowledge, other than the simple fundamentals of soldering, anyone can solder gold, silver, brass, steel, etc.—as long as the correct fluxes are used.

In purchasing a soft solder flux, all that is necessary to determine is that you are getting a "soft" solder flux. Whether or not one brand will work better than another is debatable. The secret in doing a good soft solder job does not so much depend on the flux as on the technique employed in applying the flux and heating the joint.

In purchasing a hard solder flux, the selection should be made with care as you will expect specific results from it. Most fluxes available will perform exactly as stated on the label although some may do the job more easily than others.

The average hard solder flux will usually solder anything that comes the jeweler's way, except steel and aluminum. It does not require special solder but will work with any gold or silver solder. There are also fluxes available that will solder stainless steel. These fluxes require a special solder usually furnished with the purchase of the flux. Then, there are fluxes available that will solder any metal (except aluminum) that require no special solder.

In purchasing soft solder for average jewelry work, your supplier can furnish this in a number of forms, all designed to do the job adequately.

In purchasing hard solder, a selection of various kinds is necessary. For average work it is well to have silver solder, a low karat, yellow gold solder (around 6K), 10K yellow gold solder, 14K yellow gold solder, 18K yellow gold solder, 10K white gold solder, 14K white gold solder, 18K white gold solder and platinum solder. The low karat yellow is used for the cheaper grade of plated work and for repairing spectacle frames, etc., where a low melting point is desired. The various karats and colors should be matched as nearly as possible to the article being worked with. Pink and green gold items are rare but on occasion they will turn up, and to do the job correctly means to use green or pink solder.

There are two methods of soldering available to most jewelers—by flame and by machine. It is good to know the technique of both methods of soldering since the beginner never knows what he may be forced to use in different localities. Natural gas or acetylene may not be available in some localities, leaving the machine as the only method.

Many jewelers prefer the flame method of soldering over the electric or machine type of soldering claiming that more different kinds of jobs can be done by flame than with the machine. They sometimes claim a better joint. There are just as many jewelers, however, who will uphold the merits of the soldering machine over the flame type of soldering claiming that it is quicker and just as versatile. It is certain that any shop equipped with both will hardly be at a loss for a method to do the most unusual job.

One other method of soldering that is little used today is the blowpipe method. The blowpipe is a curved hollow piece of brass, one end of which is placed in the mouth, the other end in a gas flame. By inhaling through the nose and exhaling through the tube, the flame is directed to the object which is pinned to an asbestos pad or held in tweezers. By using a steady rhythmic manner of breathing, a hot flame can be generated that will solder any desired joint. Needless to say, this method is laborious and unpopular at best, but when all other equipment fails, the job can still be completed with the blowpipe, if gas is available.

The most popular type of flame soldering is with natural gas and oxygen. Torches can be purchased with several nozzles that eject different size flames.

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With the varying effects possible by the oxygen pressure, any desired flame can be produced to suit the job.

This type of oxygen-gas torch outfit comes equipped with pressure gauge and fitting, one to attach to the piped-in gas line and one to the oxygen tank. A tank of oxygen will last for months with average use.

For those cities where natural gas is not available, an acetylene gas torch may be used that will answer the purpose. This outfit has only one fitting to attach directly to the acetylene tank, and also comes equipped with several nozzles.

In purchasing a flame soldering outfit, it is wise to be sure that it is possible to adjust the flame to a fine point and to a broad range.

Concerning soldering machines, there are many models on the market most of which will do a wonderful job if treated properly. Here, the approach to the job is entirely different from the flame method. One outstanding characteristic is the need for a close watch on the condition of the machine. All contacts have to be in perfect condition, or it simply won't work. The foot contact wires have to be in order, the carbon has to be clean at point of contact, the rheostat must function properly, and then, in order to obtain a satisfactory solder joint, the operator should have the rheostat adjusted correctly before making contact. If all these are right, the joint will blend perfectly at first contact, and all in a matter of a few seconds.

Most soldering machines are equipped with one large carbon that takes care of average work. Some have fittings, to which small pencil carbons may be attached; that make it possible to do infinitely fine work. After watching a jeweler (who is thoroughly familiar with his soldering machine) perform a minute soldering operation with his pencil carbon, it is hard to try to draw comparisons between the machine and the flame. It appears that as one gets more and more familiar with his machine, more and more jobs become possible.

(To Be Continued)

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Illustrated quiz questions, problems and solutions for students, apprentices, and advanced watchmakers. Helpful for exams; reviews; reference. 333 QUESTIONS and ANSWERS. $1.75 postpaid. Seven-day return privilege. Chicago School of Watchmaking, 2330 N. Milwaukee Avenue, Chicago 47, Illinois, Room 214A.

POSITIONS WANTED

Watchmaker, Elgin graduate, 1½ years practical experience, desires position in midwest. Write Box 11, American Horologist, P. O. Box 7127, Capitol Hill Station, Denver 6, Colorado.

NAVY WATCHMAKER CHIEF, retired, desires employment in Southeastern U. S., Florida preferred. Temperate. References. Navy job code IM, 1118-45. 10 years at the bench. Write Box 123, American Horologist, P. O. Box 2127, Capitol Hill Station, Denver 6, Colo.

DIAMONDS AND GEMS

DIAMONDS—LOWEST WHOLESALE PRICES
Airmail for price list and particulars about direct import. Established jewelers only. Joachim Goldenstein, Diamond Club, Antwerp, Belgium.

Ring stones: Genuine, synthetic, imitation, any size or shape. Stones set, rings sized. Titania gems, any size also mounted. Ace Lapidary, 160-11 Hillside Ave., Jamaica, N. Y.

STORES FOR SALE

Jewelry Store in prosperous Northern Indiana Lake Region. Stock and fixtures less than inventory. This is a money-maker for right person. No competition. Apartment and store for lease. D. D. Mock, North Webster, Indiana.

San Francisco Jewelry Store, busy residential district. Established 1915. Owner retiring. Excellent repairs, nationally advertised lines. $3000.00 will handle.
Kallerup's
316 Clement St.
San Francisco, Calif.

Jewelry Store, West Central Wisconsin, only one in city of 1600, sell for inventory including fixtures, $2300.00 for all. Ill health.
Alvin Dunn
Dunn's Jewelry
Chetek, Wisconsin

HELP WANTED

Watchmaker Wanted
Quality man with good references. Manage department, reputable store in Eastern Oregon. A fine position, plenty of work. By February, 1954. Write Box 10, American Horologist, P. O. Box 2127, Capitol Hill Station, Denver 6, Colo.

ARTICLES FOR SALE

Surplus lot New Westlake Staking Tools, Factory Guaranteed—100 Punch—20 Stump, with hand-press lever and hardwood case. Being sold at less than cost. Send check or money order, $36.00 each.
Progressive Products Co.
26 Fitch St.
So. Norwalk, Conn.

Swiss Wrist Watch Movements, 25c, 50c, 75c, $1.00. American Wrist and 18 size. $1.00-$1.50, 7-Jewel. $2.00-$2.50, 15-Jewel. 5 Swiss Wrist Watches $5.00. 5 American Wrist Watches $10.00. All need repair. 50 Assorted gold-filled crowns, new for wrist watches, $2.00.
Morris Frey Watch Co.
916 Holland Bldg.
St. Louis, Missouri

ENGLISH CLOCK MOVEMENTS, grandfather, grandmother, regulator, wall barometers, 3¼ inch, 30 Hr. Insert Units. Clock Supplies, Dials, Bezels, etc. R. W. Holwick, 177 S. Anacapa St., Ventura, California.

CLOCK MATERIAL
Krause Bros.
Wholesalers and Manufacturers
179 W. Washington St., Chicago 2, Ill.

SPECIAL GET ACQUAINTED OFFERING!
1 dozen staffs and 1 dozen stems for Font 60 only. All this for $1.00 and self addressed stamped envelope. Satisfaction guaranteed or your money back.
Willis Importing Co.
509 Willis Avenue
New York 55, N. Y.

USED tools, benches, lathes, Cleaning Machines, Staking Tools, Etc. R. P. GALLIEN & SON, 220 W. Fifth Street, Los Angeles 13, Calif.

OSCILLOSCOPES
7 inch model, $129.50. 5 inch model and kits available. Write for details.
Jack Freelin
2415 Evans
Omaha, Nebraska

Now learn how to repair worn plate bearings, Swiss style winding. Fine workmanlike way. Permanent. No solder or botch work. No oversize stems. Good for 3¾ ligne up. Excellent for 290 Gruen, 911 Hamilton, etc. Bench tested 8 years. Absolute guarantee. Send check or money order $2.50 for single sheet, clearly illustrated 4-step instructions to: R. G. Hustad, Certified Master Watchmaker, 123 West Main, Bozeman, Montana.

L&R Automatic (used only 4 weeks, exactly like new); Timing machine; Marshall cleaning; L&R Master; Lathe; Staking tool; Crystal cutter; etc.
Felix Buonaventura
830 Market Street
San Francisco, California

ARTICLES FOR SALE (Cont.)

2½" Plastic Squares for cutting out round unbreakable watch crystals with Gem Machine—$5.00 per gross. C.O.D. or Postpaid with check. G. Pamm, 90 Nassau St., New York 38, N. Y.

Levin Slide Rest with lever attachment, $115.00.
Victor Engraving Block, Complete, $45.00.
Above listed tools used, but guaranteed indistinguishable from new.
Wrona Company
7 Monument Square
Woonsocket, Rhode Island

Must sacrifice entire material and tools of recently deceased trade watchmaker. Includes the following: L&R Mastermatic, Buffing Machine, Lathe, G-S Cabinet, K&D Staking Tool. Also 55 dozen mainsprings and about 100 dozen each staffs and stems, etc. Would cost $1700.00 to $2000.00 to duplicate. Will sacrifice for $700.00.
Mrs. Carl Strittmatter
557 Hazle Street
Wilkes-Barre, Pennsylvania

Send Me One Dollar!
I send you 3 crowns, 3 stems, 3 staffs, and 1 mainspring for FF60—or for any other popular make watch. All materials guaranteed first grade.
E. A. Phillips
2831 Lombardy Court
Augusta, Georgia

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Eta. 900 Eta. 980 Eta. 1080
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Send $1.49 (3 for $3.99) to:
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Cleveland 2, Ohio

FOR SALE

FOR SALE — WATCHMASTER
Serial No. 14161, Model G11, Excellent condition. Original owner. $500.00.
Joseph Jakim
7152 Brighton Road
Pittsburgh 2, Pennsylvania

English Verge Watch, Silver, Pair Case, T. Strong, London, 1811, Fine Running Condition.
Phinney-Walker 8-Day Keyless Clock. Both $40.00.
Desk Clocks, Stamp Details.
Joseph Sambrook
153 Harral Avenue
Bridgeport 4, Connecticut

Genuine English Antiques
Tallclock movement (grandfather), 8 days, painted dial, $35.00.
Skeleton clock, pretty, $56.00.
Profusely engraved Table clock, early, striker, one hand, HINRICH NEHRING, marvelous condition, a rare opportunity, $1000.00.
Vienna regulator movement (weight) striker, complete, super quality, $20.00.
All postpaid.
VINCENT TOPHAM, ANTIQUARIAN HOROLOGIST, ASHTON-UNDER-LYNE, ENGLAND

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Here's why!

1954 can be a big year for those who really go out aggressively after business . . . No longer is the public convinced by watch-repair claims of "expert work" or "fully guaranteed". PROOF is demanded . . . the kind of proof that can be seen and understood . . . the kind made possible only by the WatchMaster and its indisputably accurate records of watch action.

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- in less time
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American Time Products, Inc.,
580-5th Ave., New York 36, N. Y.

Gentlemen,

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